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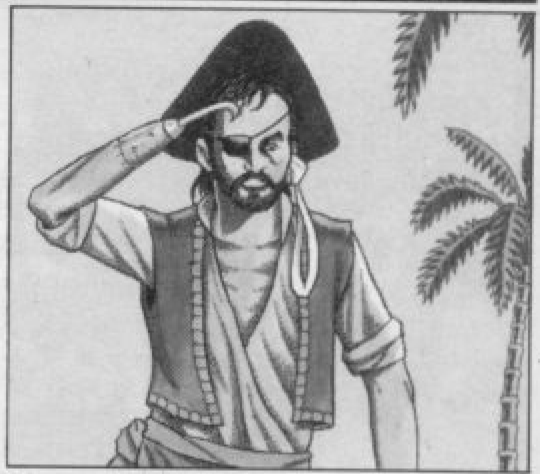
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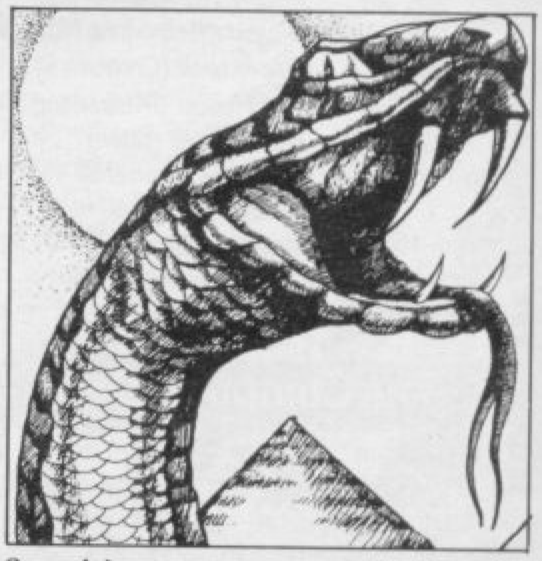
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Curse of the serpent, page 67

The great shakeout

THE GREAT SHAKEOUT in the software industry, predicted in the January and May issues of *Sinclair User*, is now underway. In the past month three major software companies, Imagine, Rabbit and Carnell, have all collapsed.

Of the three, only Carnell is likely to resurface. It had closed gracefully, declaring itself bankrupt and making its own arrangements for the funeral. Then, coming at the last minute like the 7th Cavalry, Mastertronic stepped in and saved the day. Imagine, on the other hand, despite rumours circulating for months about its imminent demise, refused to throw in the towel until it was finally, and ignominiously, closed by court order.

Imagine was one of the largest software houses, with a glamorous image. Directors Butler and Everiss claimed in June that the company's problems were shared by the whole industry. Those problems included the epidemic of piracy, the crowding of companies in the marketplace and the surprise sales collapse. Attempts by Imagine to solve those problems included lowering the price of games and then reneging on the promise, sacking senior employee Colin Stokes for allegedly passing information to rival companies, and investing huge sums in a projected series of 'megagames' which were to sell for around £30-40. Towards the end straws were clutched at and Beau-Jolly scooped the back list of Imagine games.

Though all those factors played their part, the real reasons for the fall of the house of Imagine could well be financial incompetence and inflated self-importance. One of the hallmarks of the company, dating back to its early days, was an extravagant advertising campaign for all its products and as things got worse the more extravagant that campaign became. Along with the Wrath of Magra, from Carnell, there can be few other games presold as heavily as Psyclapse and Bandersnatch. To date, neither has materialised or is likely to.

Couple that with a company lifestyle to rival that of the long-established names in the computer industry, a lifestyle characterised by a fleet of Ferraris, Porsches and Lotuses, together with a tendency to wash dirty linen in public — witness the Colin Stokes affair — and you could be forgiven for thinking that there was a certain business sense missing from the dealings of Imagine. Most of their games weren't too wonderful either.

'Why should software companies feel aggrieved when the market turns out to be rougher than they hoped?'

To give Imagine its due, there was indeed a disappointing start to the year. Stuart Galloway of Carnell Software recognises that: "January and February were dead. We couldn't shift a thing."

In truth there had been a sales boom at Christmas and the figures for January and February were well up on the previous year. What went wrong was the software industry's own prediction of those sales, wildly in excess of what actually happened. Imagine is thought to have been grossly overstocked for Christmas.

All industries are capable of over-producing, of getting the figures wrong. If a government or great nationalised industry does it, we rightly criticise those responsible for the mistakes. Why should software companies feel aggrieved when the market turns out to be rougher than they hoped?

The micro-world is full of enthusiasts, brilliant programmers with no interest or background in conventional business procedures. They have started with a single product, often written between bouts of studying, advertised in small print on the classified pages of magazines. Two years later those people occupy key positions in fully-formed companies with expensive overheads, salaries to pay, accounts to be kept, and production schedules to meet.

'What we are seeing is the birth pangs of a fully-fledged industry'

Stuart Galloway freely admits his lack of business know-how. Luckily for him and his partner Roy Carnell he has won a second chance at the market in partnership with the directors of Mastertronic. New chairman Frank Herman has great confidence in Carnell and Galloway as games designers, but the new company has been so constituted as to leave all the financial decisions in the hands of the Mastertronic businessmen and the product development in the hands of the Carnell visionaries.

Galloway is happy with that. 'Having had some experience of the world of finance,' he says, 'I think I'm well out of it. You cannot give 100 percent to the imaginative, artistic side and 100 percent to the business side. We managed 50 percent each, and it wasn't good enough.'

The Carnell-Mastertronic deal is a pointer to the future. Mastertronic has been regarded by the rest of the industry with some distaste — entrepreneurs moving in on the market to make a killing with cheap software and playing havoc with accepted pricing strategies. Carnell was built on a fantasy world, the Third Continent, which was in existence long before the computer games were designed or even planned.

The combination of business expertise and imagination should prove a powerful one for many companies. There is no reason why imagination should become stifled by business considerations as long as the consumer demands the high quality products already on the shelves.

What we are seeing is not so much the bursting of the bubble, as the birth pangs of a fully-fledged industry which can operate under the same conditions as any other industry. Of those who have dropped out of the race, we are sure that the ones with real expertise and flair will surface again, perhaps in a more disciplined environment.

The commitment of the British consumer to home computing is still the highest in the world, with 44 percent of children aged 12-15 living in a home with a computer. While that continues the British software industry will not collapse.

In the meantime the movement will be towards mergers and takeovers, with companies in related industries looking for established software houses to add to their group. While sentiment may regard such activity with distaste, it will give software companies a much stronger and more protective financial base. Expansion requires confidence, and confidence in Britain stems from visibly sound management.

How to go bust Imagine-style

IMAGINE SOFTWARE has finally collapsed, with estimated debts of at least £350,000. The Liverpool company had been in severe financial trouble for some months, culminating in a series of last ditch efforts to stave off bankruptcy.

One such attempt was to sell off 100,000 cassettes to a West German dealer at around 30p each in order to pay off immediate creditors. Those included VNU Business and Computing Publications, who obtained a court order compelling payment, following which other creditors came forward to press their claims.

Two directors of Imagine travelled to the USA in a final effort to drum up finance on the strength of the projected Mega-games, hardware-based products intended to retail at five times the price of ordinary cassettes. They returned from the States empty-handed and, in spite of the German deal, the company failed to satisfy creditors before the deadline for payment ran out. The company was then formally dissolved by court order.

The colourful style of the Imagine management has won the company few friends in the software industry. Although a number of good programs, coupled with strong advertising, ensured the company a prominent place among software houses in 1983, it seems as though Imagine has been heading for a spectacular crash for many months.

Most Imagine games have already been sold to distributor Beau-Jolly but directors Butler, Lawson and Hetherington are said to have set up a company, Finch Speed, to take over the mega-games. That was done the weekend before the court stepped in to close Imagine and it remains to be seen how they intend to produce the games with no obvious means of financing such an expensive product.

Such is the level of suspicion surrounding the final days at Imagine that Merseyside Fraud Squad is monitoring the situation, although a police officer emphasised that no formal investigation into the company or its directors has yet begun.

Another company to fall foul of the liquidator is Rabbit Software, based in Middlesex.

Both Rabbit and Imagine suffered burglaries recently in which thousands of pounds worth of stocks and equipment were stolen.

Clive across the channel

SINCLAIR RESEARCH has created a European marketing unit in Britain to launch its range of products from new premises in West Germany and France.

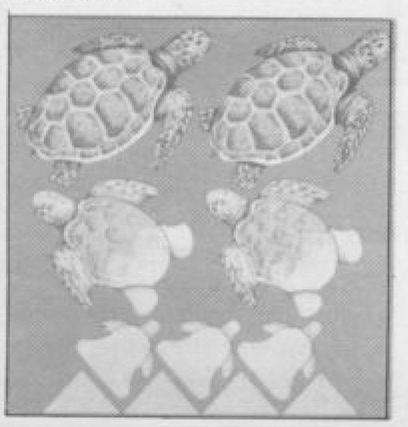
The move into Europe is the prelude to a major sales drive which, Sinclair claims, will take place during late 1984 and early 1985. The company anticipates continental sales half a million at the end of this year and, with the introduction of the QL, figures should double within the next year.

Charles Cotton, Sinclair's overseas business manager says: "Our strategy aims to consolidate our leading position in European markets and increase both sales and market share."

The company currently sells in European territories through exclusive local distributors. The new bases, in Frankfurt and Paris, will also concentrate on third-party support and service facilities which will include local language software in French and German.

Sinclair Logo

THE LONG-AWAITED version of the educational language Logo has been released for the 48K Spectrum. The package comes as a cassette with two books, one for beginners and the other for experts.



ZX Sinclair Logo is of the original Logo designed by Seymour Papert and developed by Logo Computer Systems Inc.

The company hopes to promote the language in schools and colleges. With the addition of a floor turtle robot, the package will be, at £39.00, the least expensive version of Logo.

Sinclair hopes to make the language available for the QL and there is speculation that it might be a ROM-based package which will be released with a range of other languages including Micro-Prolog and Pascal.

Fast action on pirates

A NEW organisation has been launched with the specific purpose of fighting software piracy. The Federation Against Software Theft aims to secure an amendment to the existing copyright law.

Tory MP Nick Lyall has already tabled a ten-minute Bill for debate in Parliament to pave the way for the introduction of a Private Member's Bill next parliamentary session.

"The Government supports the Bill," he said. "But cannot include it in current legislation plans because it is so busy already."

Kenneth Baker, the minister for Information Technology, has already pledged his support for FAST.

"The software industry is a very important and quickly growing sector of the economy," he said. "It is essential that it should be in a position to protect itself against unlawful copying. I would like to assure FAST of my support and encouragement for their valuable efforts in this area."

The companies represented by FAST include such names as IBM, Apple, W H Smith, Microsoft, and DEC. A spokesman for Sinclair Research said Sinclair supported the aims and principles of FAST but had not yet decided whether to join.

Same paper, new owners

THE SINCLAIR group of publications, including *Sinclair User* and *Sinclair Programs,* has been acquired by East Midland Allied Press, the publisher of *Computer and Video Games.*

The new address is EMAP Business and Computer Publications, 67 Clerkenwell Road, London EC1R 5BH.

more news on page 9

Sinclair plans for QL

SINCLAIR RESEARCH has defended the delays in QL deliveries and is confident that the same situation will not arise again.

Sir Clive Sinclair told journalists at the beginning of July: "The delays in delivery of the QL have not been as great as those experienced when other computers, such as the IBM PC and Acorn Electron, were launched yet we have tended to get all the bricks thrown at us."

At the time of going to press the machines were going out at a rate of approximately 2,000 a week and Sinclair expected that figure to have risen to 20,000 units a month by the end of the summer. Nigel Searle, managing director, claimed that any bugs which are pointed out by users will be rectified where possible and the corrected versions of the QL User Guide should have been released in August.

The company hopes that more than a quarter of a million QLs will be sold before the end of next year and has plans for several hardware and software launches during 1985 to support the growing user base.

Hardware expansion will include a 512K RAM board, Winchester disc interface, printer, and modem. None of those peripherals will be produced by Sinclair but they will be marketed under the company logo.

Big-league software companies have also been pulled into the QL market. Sinclair Research already has agreements with Digital Research, Sagesoft, MicroAPL, Scicon, Quicksilva, Lattice, Metacomco, Caxton, Psion, GST and Intelligent Software. Sinclair also aims to market the Unix operating system under license but, as with all the hardware products, will do none of the software development itself.

Criticisms of the QL keyboard and Quill wordprocessor have also been answered by Sinclair Research. Sir Clive denied that the keyboard was almost as bad as that of the Spectrum, saying: "I think that it is a superb keyboard."

David Potter, of Psion, defended the Quill wordprocessor, although he agreed it was slow when entering and displaying text. As a result of the criticisms Quill will be upgraded and its speed increased when the next version is released later this year.



Sir Clive: complains of bricks.

Quicksilva develops games for the classroom

QUICKSILVA is planning an onslaught on the education market with a suite of programs combining educational content and games. They will be developed by Quicksilva Edutainment Division and marketed under the slogan: "QED The Brainlords".

The educational games will include 'edventures', combining the traditional elements of fantasy adventure games with historical information and questions, with projects aimed at both O- and A-Level students.

"Most existing programs are totally passive," says Rod Cousens, managing director of Quicksilva. "They don't demand sufficient user involvement nor do they command attention. You have got to do something with the computer which is different from textbook education."

To ensure that the educational content will be of value, Quicksilva is combining with educational book pubishers to develop the products and is also working with academics at the Education Department of Southampton University.

Cousens is also anxious that programs take advantage of the characteristics of individual computers, hoping to produce programs for the Spectrum, BBC and QL with the launch in September.



A RECORD FIELD of 2,400 runners took part in the third Cambridge half-marathon sponsored by Sinclair Research. Sir Clive ran the 13-mile course, but failed to do for athletics what he has done for computing. Victory went to Bob Treadwell in 1hr 5m 42s with Olympic hope Joyce Smith winning the women's section.

Yanks muscle in

AN INFLUX of software from the United States is being aided by CheetahSoft, the software subsidiary of Cheetah Marketing.

The company has made a deal with Imagic, which has previously dealt with Commodore and Atari, to convert games to the Spectrum in order to market them in Britain.

The first two titles for the computer have appeared already. **Moonsweeper** involves an attempt to rescue miners on one of four moons. Three dimensional graphics show the descent to the moon. The other game, **Dragon Fire,** bears a slight resemblance to **Hunchback.** The player must enter a castle while avoiding an angry dragon.

Peter Hardingham, marketing director of CheetahSoft, says: "The graphics are very good and will remind users more of the Commodore machines than the Spectrum. It is about time that the UK was allowed to see the best American software at prices that are not the rip-off that they always have been."

"Versions have been produced for the Atari machines and Colecovision and the Spectrum games use the sprite graphics which are a feature of those machines."

more news on page 10

Carnell returns from the grave

THE DIRECTORS of Carnell Software, which was recently put into voluntary liquidation, are back in business again. Roy Carnell and Stuart Galloway have set up a partnership with senior members of Mastertronic to market the Third Continent series of games, including a long-awaited **Wrath of Magra.**

The new company, which, although financed by Mastertronic directors will be operated independently of that company, is to be called Innovisions. The Wrath of Magra will be released immediately at £12.50 and new projects are already planned.

One condition of the new deal is that the Mastertronic side will handle all financial and business details, leaving Carnell and Galloway to concentrate on the products together with Stephen Kirk, who was a programmer at Carnell and is now a partner in Innovisions.

"We are completely happy with the deal" said Stuart Galloway.

Professional database

A NEW DATABASE has been launched in the UK by Dialog, a subsidiary of the giant multi-national Lockheed Corporation.

Knowledge Index has attracted 5,000 subscribers in the U.S.A. since its launch in 1982, and a spokesman for Dialog said the company will be pleased to win 1,000 U.K. subscribers over the next few months.

The system can be accessed via modem by most home computers, including the Spectrum and QL. The service will cost £25 a year, including a manual and two free hours of use. Any further time will cost $24 an hour.

For their money, users will gain access to over 20 million items of information on a wide variety of subjects, mainly of a technical nature.

Daley goes to Hollywood

ANOTHER lunatic Automata competition has ended. Phil Daley of Stoke-on-Trent has won a trip to the U.S.A. for completing **My Name is Uncle Groucho.** Daley correctly named the mystery personality as Mickey Mouse and provided the winning slogan with: 'There's no blood in our games, it's all tomata sauce'.

Daley will fly to Hollywood on Concorde, cruising home on the QE2.

Cheap games from CCS

THE LOW-PRICED software market has expanded further with the introduction of games from Charlie Charlie Sugar, a division of Cases Computer Simulations.

The company has used the new name with its range of £2.99 games so that it will not be confused with its range of strategy, simulation and adventure games which retail at traditional market prices such as £5.95.

A spokesman for CCS says: "The Charlie Charlie Sugar range is designed to encourage impulse purchases and is accordingly priced within the average teenager's pocket money allowance. The games are excellent value for money and represent a straightforward marketing policy of offering a range of different quality, separately branded, products which are priced and packaged accordingly."

The range so far comprises four cassettes which include a whodunnit mystery, a French dice game and a version of Pelmanism.



Overseas promotion

THE GUILD of Software Houses is currently liaising with the Board of Overseas Trade to provide facilities for companies to promote their products abroad.

"We want to help companies sell overseas by representing people with joint projects," says Mike Johnston of GOSH. One possibility is to organise joint trade stands at overseas shows.

"We have also agreed, in principle, to create a list of reputable overseas dealers," says Johnston. "That would protect companies from falling victim to unscrupulous dealers in other countries."

Golden oldies ploy from Quicksilva

QUICKSILVA is planning to release a compilation tape consisting of a number of early games to retail at about £7.00

The idea is a response to the growth of cheap 'pocket-money' software from companies such as Pulsonic or Mastertronic, and would be called **The Best of Quicksilva.**

Managing director Rod Cousens believes the move is a logical step for software companies and compares the strategy with similar products in the music industry.

Top Ten

Program	Last Month	Company	Memory
1 Jet Set Willy	1	Soft. Proj.	48K
2 Blue Thunder	7	Foundry	48K
3 Trashman	—	New Gen.	48K
4 Sabre Wulf	2	Ultimate	48K
5 Fighter Pilot	3	Digital Int.	48K
6 Psytron	5	Beyond	48K
7 Chequered Flag	—	Psion	48K
8 Zaxxon	9	Starzone	48K
10 Hunchback	—	Ocean	48K

Figures supplied by W H Smith.

Summer '84

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THE CONNOISSEURS' CHOICE



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3D SEIDDAB ATTACK – Steve Turner
Using your radar, missiles and sixth sense clear the city area of SEIDDAB.
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BBC Model B/Electron

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3D SEIDDAB ATTACK – Andrew Braybrook
Using your radar, laser bolts and sixth sense you will need to clear the urban area of SEIDDAB.
Joystick compatible, 32K or 64K £7.95

3D SPACE WARS – Andrew Braybrook
Locate the Seiddab on your galaxy scanner through four levels of 3D hyperspace and destroy them.
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DRAGONFLY II – Eric Ratcliffe
Navigate from one airport to another using your instruments and a radio beacon.
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Software reviews are a matter of taste

I WAS AMAZED to read the complete load of farcical rubbish printed in the starter pack section of your June issue. To quote: "The tapes can vary in quality and it is advisable to read the reviews in *Sinclair User* and use your judgment to find the best."

My complaint is that those who have only just acquired their computer will probably have very little judgment as to what is a good computer game, and will therefore have to rely on the *Sinclair User* reviews and the Gilbert Factor which can be extremely misleading. Examples of that are the terrible **Halls of the Thing,** which has a totally undeserved factor of nine, and which has received unending praise from John Gilbert, and **Maziacs,** which despite being boring and very easy, received a factor of eight.

The review of the former prompted me to buy it in my early days of being a computer owner, and I was disappointed to find I had bought a monotonous game which required six hands to play.

To help combat the damage caused by these reviews, which appear to be based purely on the original concept of a game, along with a smattering of John Gilbert's personal taste, I suggest that a team of reviewers replace him in the job of reviewing games. That will provide a wider spectrum of opinions and would probably improve the quality of *Sinclair User* software reviews.

Steven Robbie,
aged 12,
Quendon,
Essex.

● *John Gilbert replies:* Halls of the Things *was one of the best products on the software market and was received well by the computer press.* Sinclair User *did not express the most vociferously favourable opinion on the game but treated it as a program which had just the right amount of technical excellence and playability. There are, of course, differences of opinion but contrary to popular belief I do not produce all the reviews for the magazine. Sinclair User has a panel of five reviewers and, therefore, not all the opinions expressed in the software column of the magazine are necessarily mine.*

Same game, new numbers

I BUY as many of your magazines as possible, and I'm amazed to see that all of the programs checked by you, which include random numbers, lack a statement reading: RAND 0. In other words, each time you play the game, having typed in the program, the random numbers will be exactly the same, and in the same sequence.

The function Rnd is pseudo random and follows a set sequence of numbers. Where this sequence starts is easily changeable, using the keyword RAND; RAND 12 will store 12 in memory locations 16434 and 16435. The sequence will then continue.

The important point is that RAND 12 will always give the same sequence of numbers. When the ZX-81 is switched on, RAND is set to 0 and that too gives the same numbers each time a game is played. To demonstrate that switch your computer off and on again and type PRINT RND. The first number printed will always be 0.0011291504 and the second 0.08581543.

In fact, if you type RAND N the next value of RND will be (75*(n+1)−1)/65536.

When switched on, the ZX-81 counts the frames displayed by the TV — 50 per second in England — in memory locations 16436 and 16437. The statement RAND 0 or just RAND on its own, will set the memory locations where the value of RAND is stored, to the values in the timer. That will make the RND sequence start in a different position depending on how long the ZX-81 has been on. That is the nearest the computer can get to a truly random number.

Mark Bensilum,
aged 14,
London N3

Repairing the ZX Printer

AFTER READING the letter sent in by John Cargill of Stockport, I would also like to express my views. To date I have taken 3 Spectrums and 3 ZX printers back to the shop, the last being at the beginning of April when I returned my printer to W H Smith and was told that all ZX printers were being withdrawn and any repairs would take between 2 to 3 months. I could not wait 2 months at that stage as I was expected to hand in my 'O' Level GCE Project. My last resort was to find an extra £20 to purchase an Alphacom 32 which has performed perfectly.

I also wrote a letter to Sinclair Research and in their reply was told they were sorry for the inconvenience I had suffered but were unable to offer any assistance apart from suggesting I try other shops and outlets to try and obtain a ZX printer.

After all the problems I have experienced with Sinclair I am sceptical about purchasing a Microdrive in case this too should turn out to be faulty.

Mark Claydon,
Colchester, Essex.

Hobbit fan requires help

I OWN a 48K Spectrum and if any readers could help me with **The Hobbit** I would be really happy.

Also if anyone would like to write to me as a pen-pal I would gladly reply to their letters.

I would like to thank S Chadwick from Liverpool — letters, March — for helping me practice **Manic Miner** on any screen with everlasting lives. Now I have become saner as I have at last passed Eugene's Lair.

Julia Newman,
20 Townsend Street,
Cheltenham,
Glos GL51 9HA.

Colour and the QL

I ORDERED my QL on the 15 January, a few days after the announcement. It arrived on 28 May.

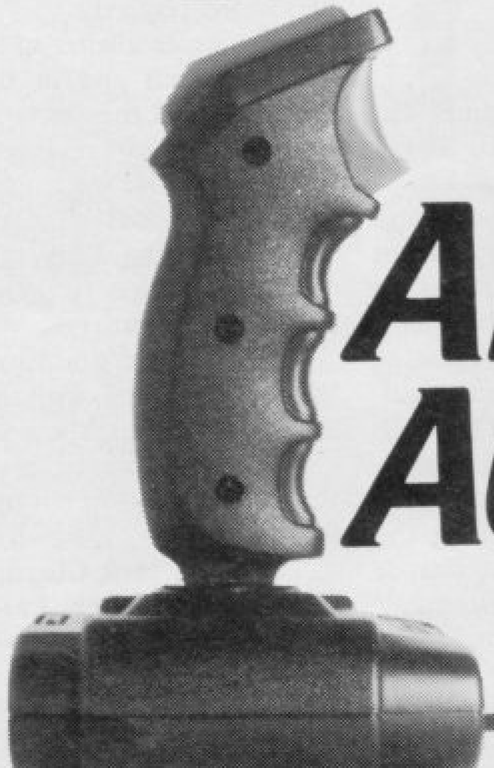
I can report that it works well with both an ARO 1401 TV and a Microdrive Cub monitor. In one respect, it is better than the brochure. Although sold as an eight colour machine, it can stipple colour together to give 200+. The manual suggests that stippling is only satisfactory on a monitor, but it doesn't look too bad on our TV. The colour codes in the manual are correct only for TV, the monitor exchanging the reds and greens. The DEFine PROCedure is a joy.

My only criticisms are the absence of user defined graphic characters, and a confused indexless manual. I really believe I must be a satisfied customer.

Phil Barker,
Birmingham.

more letters on page 15

GET TO GRIPS WITH ARCADE ACTION!





1200 Baud Modem Now Available £59.95.

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New improved design • Trigger + Top Fire Button • Auto Fire • Built in Stabilizing Suction Cups • For use with any computer with a '9 pin D' type connector. (Atari Compatible).

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**Protek Computing Ltd, 1A Young Square,
Brucefield Industrial Park, Livingston, West Lothian. 0506 415353.**

Diet expert bites back

THANK YOU for an excellent magazine. I hope that you will be able to maintain the standards that you have set so successfully.

Recently you reviewed one of my programs marketed by Keysoft, **The Dietician** for the 48K Spectrum. In the review, you stated "the program seems to calculate the ideal weight more according to fashion than commonsense."

That is a strong statement that needs justification. Has the reviewer checked the ideal weight figures given in the major medical and scientific publications? I would think not, because the figures calculated by the program agree with those given in publications such as: *The Which Book of Slimming; The Diet Center Book of Dieting; Biometrica Tables; The Book of Diets and Slimming.*

You stated also "the diet plans are over simplified." I would like to point out that one of the major problems of somebody following a specific diet course, is the diet set up and the selection of the meals.

The Dietician offers the opportunity to construct your diet in such a way that you are able to live with it. It does not require accurate weighing of various foods and calculation of their calorific content. The simplicity of the approach is its strength because it allows an infinite number of variations in the diet menus.

Whatever diet you decide to follow, you have to devote some time during the initial stages to come to grips with it. No diet method can avoid that but I believe that The Dietician helps you live with your diet.

You cannot judge the effects of a treatment after the first course; you have to follow it to express a valid opinion.

Dr E Frangoulis,
Imperial College of Science and Technology,
London SW7.

Sinclair is not alone

LIKE HUNDREDS of others, I have had problems with my Spectrum — I am now on my third — and I too have had my letters to Sinclair ignored.

I have also written two letters each to Microvitec and Miracle Systems Ltd. Are those companies making so much money that they can ignore possible orders of £200 and £75 respectively?

Compare that to the excellent service received from DRG Business Systems, JLC Display Electronics, Timedata Ltd, who went out of their way to solve the matter for me, even reimbursing the postage.

I suppose those excellent companies do balance those with poor service records but unfortunately it is the latter that cause us so much hindrance in our pursuits.

M S Baines,
Watford,
Herts.

Help for the handicapped

WE ARE in the process of establishing a database of software for the handicapped — BARDSOFT. Each entry will contain a description of the programs, the handicaps they are suitable for, the type of computer system required, name and address of supplier/developer and price.

The aim of BARDSOFT will be to facilitate the exchange of information on software relevant to the lives of handicapped people,and to promote the database, and therefore the software, abroad. That is what we have been doing successfully for non-software products in the field.

As we are currently collecting and processing information, we would be pleased to hear from any of your readership who may wish to contribute to BARDSOFT.

Peter Curran,
Handicapped Persons Research Unit,
Coach Lane Campus,
Newcastle upon Tyne
NE7 7TW.

The Wizard runs in 16K

A MISTAKE was made in the explanation for the program **The Wizard** published in the July *Sinclair User.* The program will run on the 16K Spectrum, not just the 48K as stated. 48K owners will be able to amalgamate all four listings into one, but the 16K computer with the instructions and large data arrays had to be saved separately.

M Gordon-Kerr,
Welton,
N Humberside.

Sabre Wulf in Scandinavia

WE ARE two boys writing to you from Norway about **Sabre Wulf** from Ultimate. The game has very impressive graphics and it is really fun to play in the beginning.

You find yourself out in the jungle. There you have to find a ring broken in four pieces. Each time you find a piece there is a verse and a melody. The four verses are:

One piece is all that you have found,
collect three more and outward bound.
Two pieces are yours to keep,
this score again is what you seek.
One piece more must you amass,
and find the keeper you may pass.
Four pieces found have now made whole,
to find the cave must be your goal.

When you have collected the pieces you will find a picture of a wolf on the screen. Then you must find the cave where the keeper is. He will let you pass if you have brought all the pieces with you, and the game is over.

We solved the game on June 28 after spending four days on it. Everything with the game is superb, except that it is as easy as all the other Ultimate games.

Hans Christian Nilsen and Bjorn Tore Eriksen,
Harstad, Norway.

HAS ANYONE collected all four parts of the magic amulet in **Sabre Wulf** and escaped from the jungle?

If not, then I am the first. On July 1 I finally passed the guardian and entered the outer world of the Ultimate earth.

Jonas Froberg,
Kungsbacka,
Sweden.

Colour codes explanation

WHILE EXPERIMENTING with the attributes I discovered how to use them in a listing. That can be very useful and can save much time and memory.

To use them press the keys as follows: first select E-mode; for paper colour press any colour key; for ink colour CAPS shift then press any colour key; for Bright 1 press key 9; for Bright 0 press key 8; for Flash 1 CAPS shift, key 9; for Flash 0 CAPS shift, key 8.

If you get the dreaded buzz the best thing is to delete the line and start again.

B H Neal,
Abingdon, Oxon.

more letters on page 16

Letters

16K Spectrum is an endangered species

WHAT HAS HAPPENED to the 16K Spectrum? The animal is rarer than a giant panda. After trying 11 retail outlets in my area I had to buy a 48K model, something I didn't want to do as I couldn't really afford the extra £30 and I wanted to fit the extra chips to make 48K myself.

I was told in several shops that 16K machines are only available from Sinclair and then you have to wait a while. Is Sinclair Research unhappy with people buying the smaller machine and converting it to 48K — thereby saving some cash — and consequently ceased distribution of the 16K model?

After several phone calls to Sinclair the only reply I obtained was the "people aren't buying 16K Spectrums anymore." That is hardly surprising if they aren't making them available.

David Levett,
Letchworth,
Herts.

Piracy in the classroom

I FEEL I must write about home computers and the huge software piracy which goes on. In my class at school there are 26 pupils of which 17 have computers. I asked them if they had ever copied a game. All of them admitted they had. I asked them if they had ever bought a game and to my surprise and horror only three had. It's little wonder, then, that software companies are having to merge. I am not saying that I have never copied a game but at least I buy a lot too. I hope that this will make all readers aware of what we are doing to the software industry. The next time you load in **The Key** or **Kopy-Cat,** give a thought for the software company you are helping to bust.

Julian Rowland,
aged 16,
Winsford,
Cheshire.

Clean-living Trashman

I AM GLAD to inform you that I successfully completed **Trashman** after two hours of eye-straining agony playing the game.

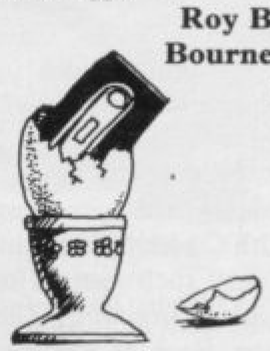
Do not enter the pub unless you are greatly in need of the points as you end up falling over with drunkeness.

R Brown,
Totley,
Sheffield.

More fun from the hen-house

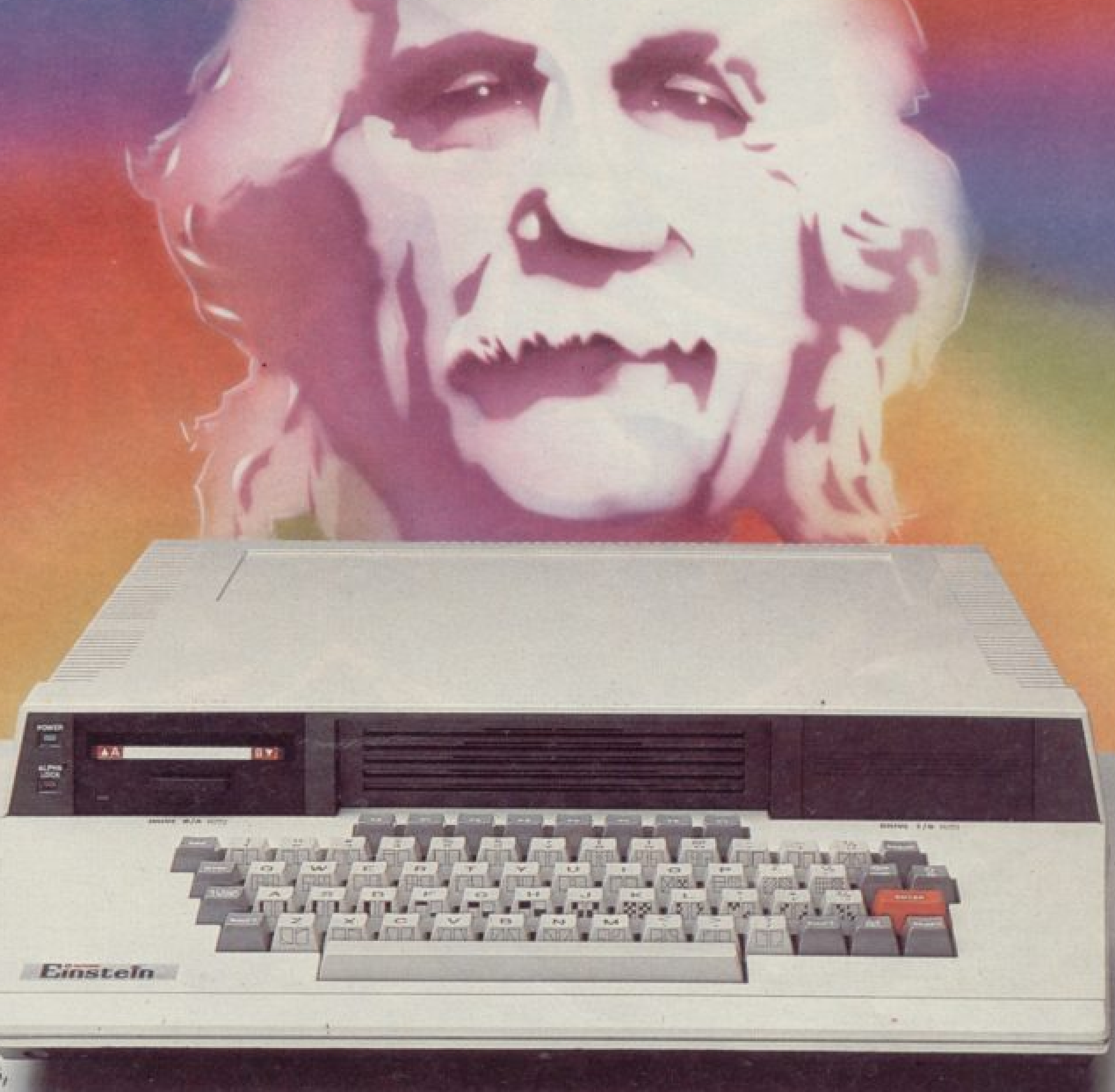
IN REPLY to Harry Leeson's letter in the June issue of *Sinclair User* asking whether there is life after level 40 in **Chuckie Egg,** I can confirm life until 64 with a score of 1,422,760. I hope this encourages him to eat more eggs.

Roy Bicknell,
Bournemouth,
Dorset.





A COMPLETE COLOUR MICRO WITH NO HIDDEN EXTRAS FOR AROUND £499.



The title of 'genius' is not bestowed lightly on man or machine: those extraordinary qualities and powers of intellect are rare.

Einstein had them in full measure. And so now does the new micro computer from Tatung, designed and built in Britain and appropriately named – Einstein.

Einstein was created by Tatung, one of the world's leading electronic companies, and given the capacity and the remarkable capabilities to compete with computers costing far more.

Its simplicity of operation will appeal to the first time buyer and to businessmen who don't want to lose staff to expensive and time-consuming training courses. At the same time its operating system is both powerful and sophisticated to satisfy the most advanced requirements.

For those who have outgrown their existing primitive machine, the speed and capacity of the 500K built-in disc drive will make all the difference. And for the small businessman, the ability to store and retrieve all information in seconds will be as important as Einstein's built-in flexibility, which allows the system to grow as the business develops.

BUILT-IN 80K MEMORY
Total memory capacity 80K RAM divided into 64K 'user' memory and 16K for colour graphics production.



BUILT-IN DISC DRIVE
500K 3" compact floppy disc drive. Potential for massive extra storage with a second 500K disc drive internally.

BUILT-IN 16 COLOUR GRAPHICS High resolution graphic animation from 32 sprites (definable shapes), 16 vivid colours.

BUILT-IN EXPANSION PORTS
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Powerful Crystal BASIC. Multi-lingual plus ability to run CP/M.†

BUILT-IN VERSATILE SOUND
Sound synthesiser facility includes chromatic music with three voices. Substantial speaker with volume control. Provision for speech synthesiser.

Einstein has them all. Feature for feature, it meets the needs of the novice and the experienced operator, both at home and in the office.

Einstein, designed and built in Britain, is a complete colour micro computer with no hidden extras.

And for under £500 is sheer genius.

TATUNG
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DIAL 100 AND ASK FOR FREEFONE EINSTEIN FOR YOUR NEAREST STOCKIST.

"I COULDN'T BELIEVE THE SPEED..... YOU'RE THE BEST BY FAR"

(Paul Singleton, Cheshire)

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The **CURRAH SPEECH SYNTHESIZER** is very popular. If you **don't** buy one, the 'Currah compatible' games work perfectly well. If you do own Currah Speech, it brings the games to life in the most amazing way!

ALL PROGRAMS REQUIRE 48K

THE HULK ***"Furiously addictive, I struggled with it for hours. The graphics are excellent ... a very enjoyable game" (PCGames).*** Scott Adams has finally produced his first graphic adventure. The text is as witty and involving as ever - but the graphics really bring it to life. You don't even die when you are killed (so you can carry on!). NO STIX. (Adventure Int'l) **£9.95**

WORSE THINGS ***"One of the most original games of '84.... incredibly addictive, playable game" (Crash).*** 'WORSE THINGS HAPPEN AT SEA' as you try to take your cargo ship from port to port before it sinks. Full-screen animated graphics as you search the ship for leaks. On later journeys, watch out as the ship wanders off course, too .... or the engine overheats! Great tunes, too. STIX: Cursor/Interface2. (Silversoft) **£5.95**

SABRE WULF ***"State-of-the-art Spectrum software ... the graphics are superb" (Crash). "Possibly even Ultimate's most impressive game" (PopCompWkly).*** Beautiful, really wonderful jungle maze for you to explore. Avoid the charging rhinos, slippery snakes, warthogs, bears and all the other animated animals. Search for the four pieces of the Sabre Wulf mask - then see what happens. It will take you a very long time. STIX: Kempston/Cursor/Interface2. (Ultimate) **£9.95**

TORNADO LOW LEVEL Not a flight simulation - it's easier to operate and more exciting, too! Fly your swing-wing supersonic tornado (you can watch from above). Fly low to wipe out enemy targets; land; refuel; take-off. The 3D landscape you fly over is the best we've seen - and your radar actually shows a map, not just blobs! All the thrills of real flying. STIX: Interface2. (Vortex) **£5.95**

LORDS OF MIDNIGHT ***"THE GRAPHICS ARE SUPERB.... it's obviously going to be an outstanding success" (PopCompWkly).*** Most elaborate adventure yet as you explore the land of Midnight. You see it only through the eyes of the characters you control. You will see only what they see from where they stand - 32,000 different views. Choice of two adventures. The whole family can play by controlling one character each. 32-page illustrated manual. PRIZE, too! STIX: None. (Beyond) **£9.95**

TASWORD 2 ***'IF YOU HAVE A SPECTRUM, AND WISH TO DO WORD PROCESSING ON IT, YOU COULD HARDLY DO BETTER THAN TO USE TASWORD 2" (PersCompNews). "An excellent program ... if you have been looking for a word processor, then look no further" (Crash). "Without a doubt, the best utility I have reviewed for the Spectrum" (HomeCompWkly).*** It is, as everyone agrees, the very best word processor for the Spectrum. Try it and see. Microdrive compatible. NO STIX. (Tasman) **£13.90**

PAINTBOX ***"I've never had so much fun with a utility program" (ZXComp). "A powerful graphics aid. It's possible for even a beginner to draw reasonable pictures" (S.User). "If you've been looking for a Spectrum graphics aid this seems like one of the best" (PopCompWkly). "One of the most outstanding programs I've seen this year" (YrSpec).*** If you want to draw, you need PAINTBOX. STIX: Kempston/any cursor. (Print&Plotter) **£7.70**

DUNGEON BUILDER ***"THIS IS A MASTERPIECE... the really amazing bit is the facility to draw the pictures... outstanding" (Home CompWkly). "An excellent graphic adventure games creator which simplifies the generation of even the most elaborate adventures" (Crash).*** With the 15K of pure machine-code you can write your own graphic adventures. 2½ years in the making! NO STIX (Dream) **£9.95**

OMNICALC 2 **THE BEST SPECTRUM SPREADSHEET:** MICRODRIVE COMPATIBLE! ***"The easiest program of all to use... the manual is by far the best" (PopCompWkly). "It stands out from the rest... it is very difficult to go wrong" (PersCompNews). "A very powerful tool" (S.User).*** The **only** Spectrum spreadsheet entirely in m/code. Up to 5000 cells. Print out OK. Bult-in bar-chart routine. NO STIX. (Microsphere) **£14.95**

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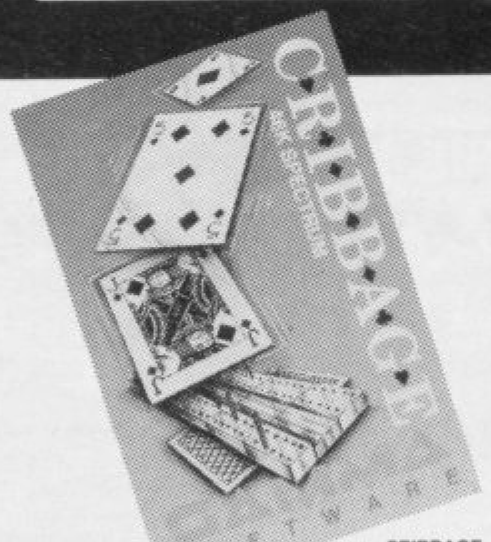
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Looks like the **MADHATTER** will be in for a busy afternoon – will everything be ready in time?

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In your search for Thorg, leader of the Death Moon Tribe of Orcs you must first find the Magic Runesword needed to destroy him and then seek out their underground stronghold somewhere in the Savage Lands.

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campbell systems — for spectrum 48k

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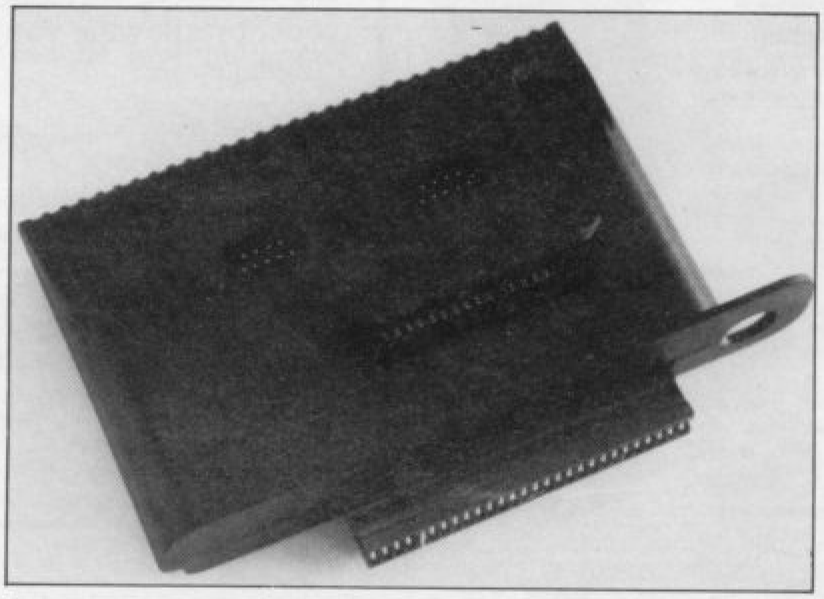
CS

Interface 2 alternative — high quality, lower price

THE RAM TURBO joystick interface for the Spectrum by Fleet Electronics is what Interface 2 should have been. As well as having two joystick ports, as on Interface 2, it also has a ROM cartridge slot, again like Interface 2. In addition, one of the joystick ports can be used for Kempston-compatible games and the other, if set up at switch-on, can be used as a Protek (cursor) compatible port.

The rear connector is a full Spectrum size as opposed to the Interface 2 ZX-81 size and the area surrounding the joystick port is big enough to take a standard D-type joystick connector.

To prevent users fitting the interface with the power on — the most certain way to blow up your Spectrum — it incorporates a 'Spectrum protect adaptor' a loop of plastic which covers the power socket on the Spectrum so that the lead must be removed before fitting. The only difficulty experienced with the interface was when trying to use a joystick with two independent fire buttons. When the second button was pressed the computer crashed.



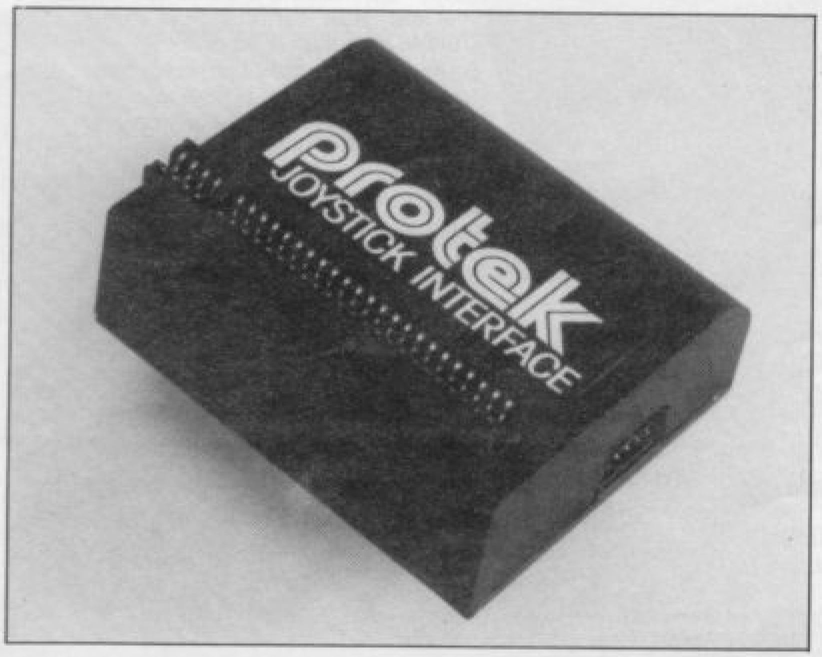
If you are thinking of buying Interface 2, the RAM Turbo interface is better-designed and better value. It costs £22.95 plus £1 p&p from Ram Electronics (Fleet) Ltd, 106 Fleet Road, Fleet, Hampshire GU13 8PA.

Programmable interface wins praise for Protek

THE NEW SWITCHABLE joystick interface for the Spectrum from Protek can make games playing very much easier. All that needs to be done is to plug it into the back of the Spectrum, connect a standard joystick and load the game. A switch at the back is used to select either Protek (cursor), Kempston or Sinclair — 6, 7, 8, 9, 0 — keys and you can switch between them while the game is playing.

The interface is, as is all too common with add-ons, dead-ended, so it must be the last add-on fitted. As with the Turbo interface, it is liable to crash if used with a twin fire button joystick. Its main disadvantage is that in the Protek position the top row of keys is disabled while in the Sinclair position only the 6,7,8,9 and 0 keys are disabled, which could make some games difficult to play. The switch would have to be moved, the key pressed, and the switch returned to its original position.

Despite those difficulties, which should not affect most users, the interface is easy to use and covers nearly all of the games on the market. It costs £19.95 and Protek is at 1A, Young Square, Brucefield Industrial Park, Livingstone, West Lothian, Scotland.



Kit makes loading easy

EASYLOAD from Maplin Electronics is one of those add-ons which displays the inherent limitations of the Spectrum. It fits between the Spectrum and a tape recorder and obviates the need to swap leads when LOADing and SAVEing. It also filters the signal to improve recordings and solves the difficulties which can occur if you have an AGC on your recorder.

It is sold only in kit form and is not really for the novice but with patience construction is fairly straightforward. The instructions are thorough and include a resistor code chart for beginners. They lead you through the assembly step by step and also have a section which shows how to test it before use.

A set of additional cassette leads is supplied with the kit and, once built, it can be fitted and almost forgotten. Its only disadvantage is that it is battery-powered but a rechargable battery can be used and a socket is incorporated to take the Spectrum power supply for charging.

At £9.95 the kit is very good value and essential if you have cassette problems. A suitable case is available for an extra £5. Contact Maplin Electronic Supplies Ltd., PO Box 3, Rayleigh. Essex SS6 8LR or any of its shops.

more hardware on page 23



COURSEWINNER

The Punters Computer Program

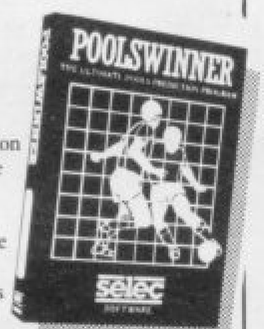
COURSEWINNER allows you to use the power of your computer to get the edge on the bookmaker.

- COURSEWINNER contains a database full of detailed information on all English and Scottish flat courses. The ten leading jockeys and trainers, and effect of the draw is detailed for each course. This information can be displayed on the screen at any time.
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- COURSEWINNER is simple and quick to use, yet very powerful.
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Available for:
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Robin Helmer



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Problems associated with Sinclair ownership..



As well as providing the solution to many a problem, Sinclairs like most Micro's however do present more than a few of their own. Like how do you prevent them gathering dust when not in use, stop them from getting kicked when Mum's cleaning the lounge, divert the dog from showing them his affections, or even ensure they at least "arrive" safely when Dad decides to take them down to the local.

We at P.A.S. realising these needs, have now developed a range of three superbly made protective cases specifically designed for Sinclairs and the like. Each case is constructed from Solid Resin Fibreboard has a fully protective foam lining, a carrying handle, internal retaining strap, a double snap-fastening lid and a price that defies even Sinclair logic.

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Improved light pen

AMONG hardware releases promised by dK'tronics is a new version of its Spectrum light pen. The pen is supplied with software for both 16K and 48K versions and is a vast improvement on the old version.

As with the majority of light pens, there is an interface which connects to the computer, in this case the inevitable black box which fits into the user port and which is dead-ended, and a pen which plugs into the top.

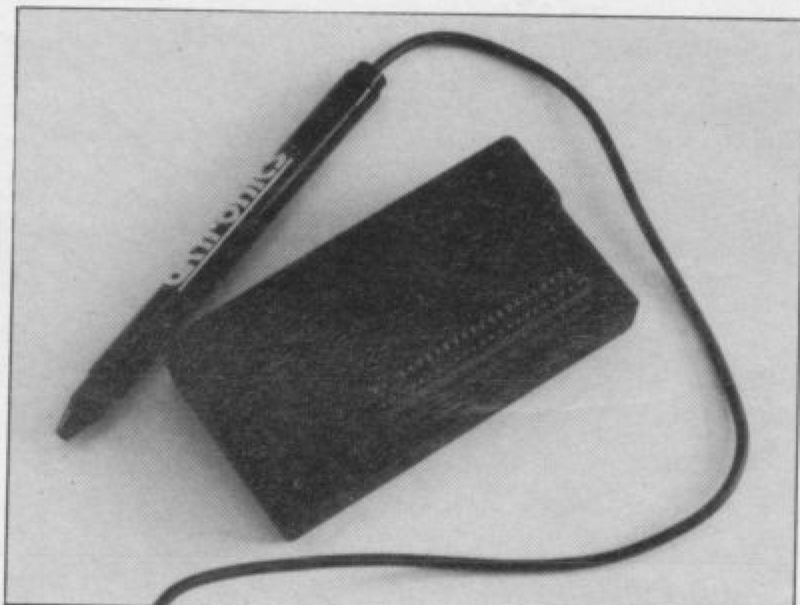
The interface contains a minimum of electronics; all the work is performed by the software. A TV picture is made up by a spot of light which zig-zags down the screen. By timing how long it takes from the start of the scan to when it is picked up by the pen, the software can determine the position.

The instructions show how you can use it in your programs to choose from a menu and give you the address of the 96 bytes of code needed. In addition, the software contains a drawing program which can be used to create pictures.

The program offers a number of options to draw lines, arcs, boxes and circles, fill areas, change colours, insert text and LOAD and SAVE pictures to tape. On a 48K machine up to four screens can be kept in memory at once and then recalled, singly or one after another, to provide limited animation. The acid test of a light pen is when trying to draw freehand and that it does remarkably well. The straight lines are straight and the pen draws where it is pointing.

The only disadvantage is the lack of error-checking on some of the commands, such as when drawing an arc which goes off the screen when you are dumped back into Basic. You can return to the picture without losing it but it is annoying.

If you are looking for an accurate light pen you could do far worse than this pen which sells for £19.95, from dK'tronics Ltd, Unit 6, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3AQ and computer shops.



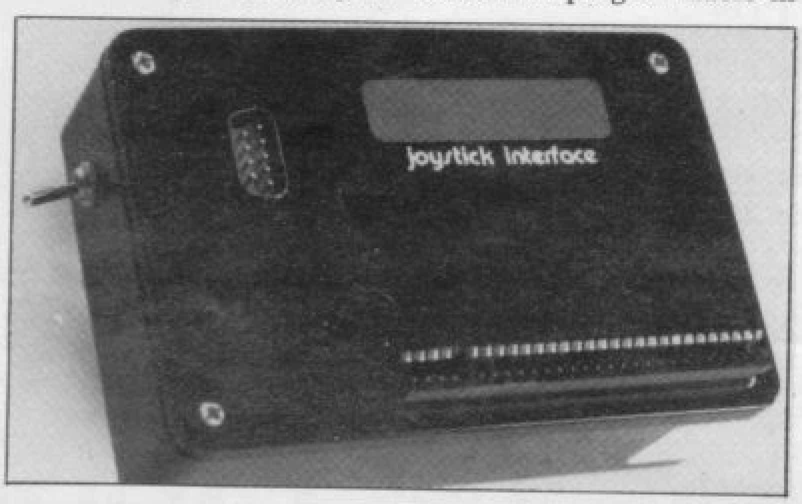
Programmable interface for rapid fire freaks

NEW JOYSTICK interfaces abound this month. One such is the programmable interface from Page Computing. It is of the type where you have to push a key, move the joystick, release the joystick and then release the key. That has to be done for the normal four positions, again for the four positions plus fire, again for the diagonals, again for the diagonals plus fire, and finally the fire button alone. All of that can be done with the game running, as the keyboard can still be used.

As mentioned in previous reviews of programmable interfaces the programming sequence leaves much to be desired; while it does the job it was designed to do, it is rather fiddly. Pressing up to three keys at once and moving the joystick at the same time is not the easiest feat.

The one really useful feature of the interface is a rapid fire switch. When it is put in the up position it simulates the fire-button being held down and that is very useful for the zap-everything-in-sight type of game.

At £26 plus £1 p&p the interface will be useful if you do not mind the time and hassle of programming it. Page Computing is at 28 Burwood Grove, Hayling Island, Hampshire PO11 9DS.



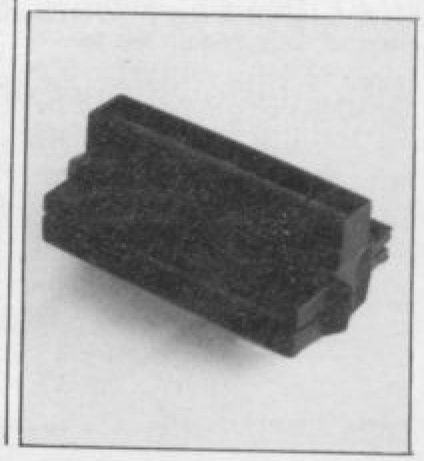
Expansion made easy

THE NEW μSlot from Currah, noted for its μSpeech, is designed to allow two dead-ended add-ons to be fitted at the same time. The unit plugs into the back of the Spectrum and has two extender cards, one from the back and the other vertically, for the add-ons.

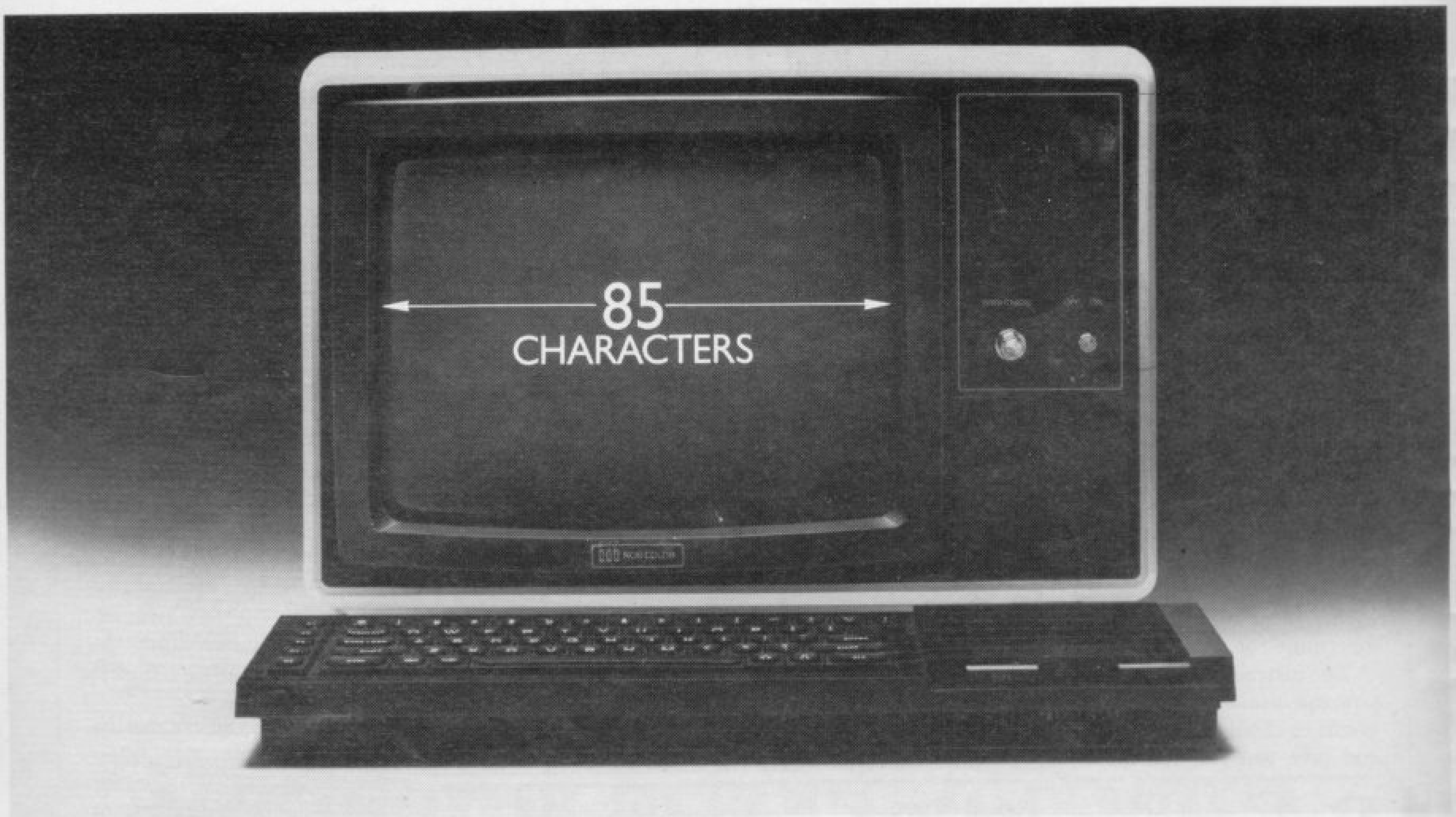
In that way you can use the μSpeech and joystick interface at the same time or, for full-size keyboard users, it permits a Kempston printer interface to be fitted easily.

The vertical slot may prove to be of limited use and, if you have ever experienced ZX-81 RAM pack wobble, you may find it better to use a flexible connector if you have a number of add-ons to fit. Nevertheless the μSlot has many uses.

Costing £14.95, it is available for Currah Computer Components Ltd, Graythorp Industrial Estate, Hartlepool, Cleveland TS25 2DF.



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Four from Fawkes

GAMES COMPENDIUMS are usually poor value for money — if a game is not good enough to stand on its own then it is probably not worth buying as part of a tape with four or five such mediocre programs. **Gamestape One** from Fawkes Computing is, however, an honourable exception. Four games are provided, all for the ZX-81 16K, and although none are earth-shattering in concept or programming, they are all of a reasonable standard, and represent excellent value for money at £5.95 for the lot.

The first game, **Dodge-it,** is a variant of the elderly arcade game Racer in which you had to drive a car around a series of concentric tracks eating up dots and avoiding other cars.

Dodge-it replaces cars with monsters and includes four different speed levels, from easy to suicidal. The fastest rate is vile.

There is also a strawberry which appears at random and which provides bonus points if you pass over it, though the gap left by the strawberry can be used by the monster chasing you, which renders the game increasingly difficult the more bonuses you acquire.

In **Trojan Dragon** you are the defender of a castle which is under attack by an evil wizard. The wizard sends his men in two directions — some try to get into the castle through the drawbridge, others climb the back of a presumably wooden dragon to storm the battlements.



While all that is going on, your own reinforcements are trying to enter, and you must open and lower the drawbridge to let them pass while making the bad guys fall in the moat. At the same time you must keep an eye on the battlements and fire arrows at the invaders.

The combination of action at the top and bottom of the screen makes Trojan Dragon a hard game to play even at the easiest of the three levels. Instead of increasing the speed of the game, the higher levels of Trojan Dragon make it difficult to distinguish friend from foe. It is the weakest game of the quartet, but nevertheless enjoyable and competently written.

Death Trap is an arcade-strategy game, in which you move round the screen attempting to avoid the black squares which the computer fills in adjacent to you. Eventually you will be trapped and must pass onto a black square, so the secret is to try to ensure that there is plenty of white space all over the screen. You can also create your own maze as you play.

While it is clearly the simplest of the four games, and easy enough to program in Basic, Death Trap is a fast, all-machine-code game with two skill and three speed levels, and requires both strategic thought and quick reactions to survive for long.

Finally, a full text adventure is provided, **The Tablets of Hippocrates.** Hippocrates was the first 'modern' doctor, and his lost tablets are supposed to contain a cure for cancer. It is your task to find them, using the usual two-word commands as you explore forest clearings, underground passages, and a cathedral. With about 35 locations the adventure is not of great length. The problems, however, are difficult and ZX-81 adventure buffs will no doubt be grateful for a new challenge.

Although the size of the game is limited by the use of Basic, there have been so few adventures released in recent months for the machine that any competently written program is welcome. Indeed, the ZX-81 is better suited to adventures than to arcade games, and large adventures can be squeezed in using machine-code and compression techniques. If Spectrum programmers can fit in over 200 locations then ZX-81 writers should be able to manage at least 70.

Gamestape One is good value for money and presents a thoughtful variety of games with something to please everyone. It can be obtained from Fawkes Computing, 41 Wolfridge Ride, Alveston nr Bristol BS12 2RA.

Chris Bourne

GAMESTAPE ONE
Memory: **16K**
Price: **£5.95**
Gilbert Factor: **7**

Playing the numbers

VALUE FOR MONEY is not a concept usually associated with gambling, except by inveterate gamblers. Amid the welter of Pools prediction programs one stands out as candidly admitting that the calculations performed by the computer have nothing whatsoever to do with team performances, goal difference, or the potential stamina of Glenn Hoddle's left knee. It is also, incidentally, very expensive.

Poolster, by Naigram Software, introduces the concept of number affinity. The theory is that some numbers have a special attraction to other numbers and that certain numbers on the Pools coupon stand a better chance of yielding a score-draw if their associated numbers also win. Naigram Software has gone to enormous lengths to construct tables of these apparent statistical anomalies, in order to predict likely selections on the Treble Chance.

The program takes an extremely long time to come up with the magic numbers, even in fast mode — if you really believe in of all this mumbo-jumbo, then you will not mind the wait.

Others, less inspired by the cosmic effect upon the morale of Arsenal when playing at number eleven on the coupon, will probably prefer to use the old pinprick method, which has a far greater affinity with football than Poolster, in that whenever you lose you feel sick as a parrot.

If you fancy the idea of number affinity, you can obtain Poolster from Naigram Software, c/o Soho Synth House, 18A Soho Square, London W1V 5FB. Naigram says it would like all winners to send in 10 per cent of their winnings. Chance would be a fine thing.

Chris Bourne

POOLSTER
Memory: **16K**
Price: **£13.00**
Gilbert Factor: **3**

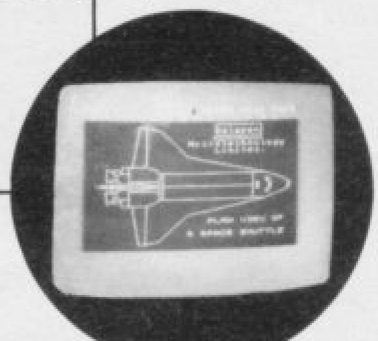
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A QUALITY LIGHTPEN

for use with the SPECTRUM computer

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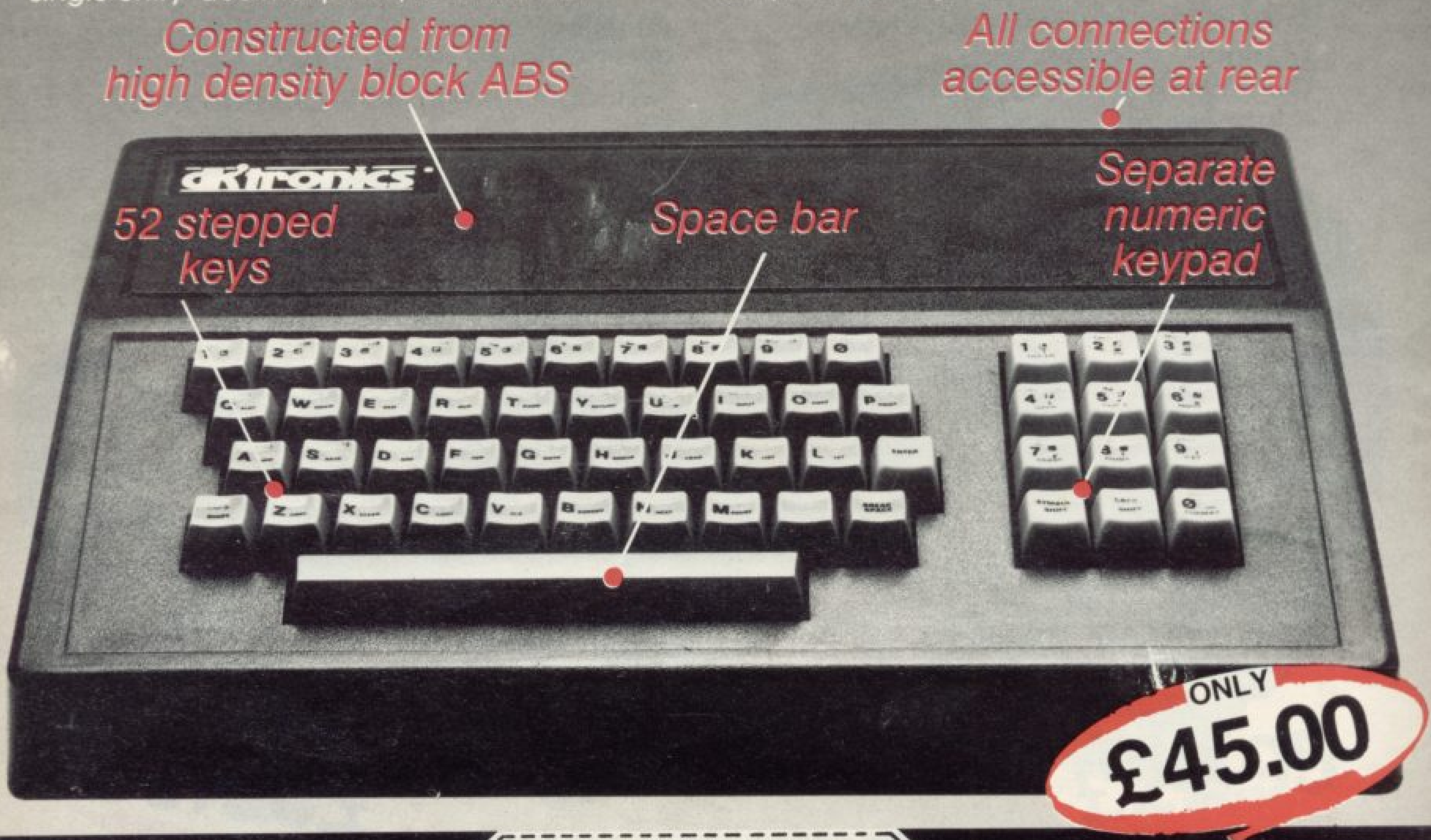
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The Spectrum Connection

Dark side of Midnight

THE ARMIES of Doomdark are rising, swarming like locusts over the plains and passes of the land of Midnight, bringing with them the ice-fear, which drains the soul of courage and renders the bold sword arm numb with fear. Midnight's last hope is Prince Luxor, holder of the powerful moonstone. That, as if you had not guessed, is where you come in.

Lords of Midnight is a truly epic adventure from Beyond Software. You play the part of Prince Luxor and his allies, whose movements you control through the telepathic power of the moonstone. During the day you, and those you have won to your cause, travel the land raising armies, fighting battles, and sending ambassadors to recruit more Lords to your side.

The most striking feature is the superb graphics system, whereby the screen displays your view of the land from where you stand. Distant objects become bigger as you move towards them and you will need to develop a keen eye to spot significant features on the distant horizon. Fortunately, you are provided with a map of the Land of Midnight to help you plan your campaign, although deliberately it omits many features and gives only an approximate indication of distances.

The graphics are built of standard pictures for various parts of the landscape; it is claimed that there are 32,000 possible views, all different in some respect from each other. Fortunately there is sufficient variety and detail in the pictures to sustain interest and the information contained in them is vital to the game, as there is very little accompanying text.

Unlike most adventures, Lords of Midnight is not played with pseudo-English commands but with a keyboard overlay setting out your options. In certain circumstances the CHOOSE option will provide a menu of further decisions, such as initiating a battle or recruiting men. Those decisions depend on the qualities of individual characters; if a commander is very frightened, he will be less likely to consider joining a battle. Likewise, movement is determined by terrain and physical stamina. The system of menus may appear slightly confusing at first but rapidly becomes easy to use and the response time is excellent, with pictures generated almost instantaneously.

There are two distinct types of game combined in Lord of Midnight. First, there is a quest, as Luxor's son Morkin is set the task of travelling into the heart of the realm of Doomdark to seize and destroy the ice-crown, the source of all evil power. Only Morkin is pure and bold enough to do that.

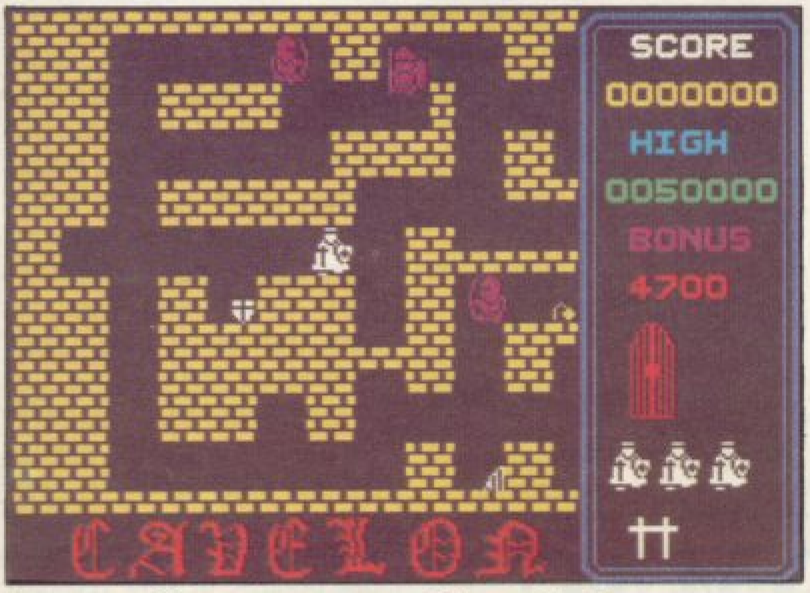
Second, Luxor and his armies must attempt to conquer Doomdark militarily, or at least prevent the enemy capturing the key citadel of Xajorkith. Thus the game can be played either as a war game or as a quest but both elements affect each other, for the war may distract Doomdark's armies from Morkin, and the closer Morkin gets to success, the less Doomdark can direct his ice-fear against Luxor's armies.

If you love fantasy and wish to immerse yourself in a genuine tale of epic adventure, Lords of Midnight will provide as authentic a taste of Tolkien or Donaldson as any game yet produced.

Chris Bourne

LORDS OF MIDNIGHT
Memory: **48K**
Price: **£9.95**
Gilbert factor: **9**





In days of old...

BEFORE common churls such as French peasants and Spectrum owners are allowed to become knights, they have to win their spurs. In olden days the process involved all kinds of unpleasant rituals and ordeals but technology has changed all that. Today all you have to do is beat **Cavelon,** a new release from Ocean Software.

Cavelon is a near replica of the arcade game produced by Ocean under licence, in common with many of that company's products. The object is to guide an apprentice knight through a series of mazes to rescue a fair damsel from the clutches of an evil wizard. There are five mazes to traverse and a final shoot-out with the evil wizard who has a supply of fireballs for the express purpose of incinerating cocky young would-be knights.

Cavelon is not a sophisticated game relying on a proven arcade success and general playability rather than originality of concept or majestic programming, but it is certainly fun.

Chris Bourne

CAVELON
Memory: **48K**
Price: **£5.90**
Joystick: **Kempston, Sinclair, Protek**
Gilbert Factor: **7**

Anyone for tennis?

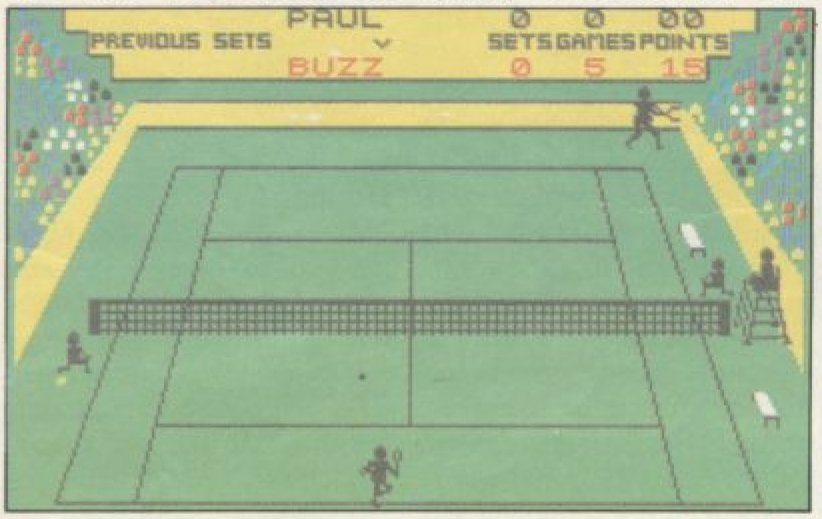
WIMBLEDON has gone and strawberries are out of season but the Psion **Match Point** tennis game for the 48K Spectrum will be popular all the year round.

The simulation has more than the classic quality and style of Chequered Flag, the Psion racing game, and provides some of the most spectacular graphics for the Spectrum.

The screen display shows Centre Court at Wimbledon. The panorama provides a view of the net, umpire, crowds moving their heads, and even the benches on which the players sit after a game.

You can play either a quarter-final or semi-final if you are inexperienced, or a final if you want to be thrashed soundly by the other player. If you have no human friend with whom you can play, the computer will always be on hand for a game.

When you start to play you may have difficulty distinguishing between the ball and its shadow. Once you have played a few games, however, the effect falls into place and adds a three-dimensional quality to the game. The shadow of the ball is the only unrealistic feature of the display as, in real life, the players cast the shadows and not the ball.



Psion can be forgiven for introducing the shadow, as the game outclasses most other sports programs for the computer. Unlike most of the other games available it can be described as a true simulation.

It is a game for all the family and not only for the sports enthusiast. Although it does not replace the real thing it is a worthwhile program, as it is a simulation which provides an exhibition mode which you can sit and watch while two computer-generated players go through the motions. It might even teach the beginner something about the skills required in the game.

John Gilbert

MATCH POINT
Memory: **48K**
Price: **£7.95**
Joystick: **Sinclair, Kempston, Cursor.**
Gilbert Factor: **9**

Kt x B, kerBOOMM!

WHEN is chess not quite chess? When it is the Artic **Death Chess 5000.** Purists will shudder to hear that Artic has produced a chess-playing program in which the result of piece taking piece is decided by an arcade action sequence and not by the immutable laws of the game.

The program consists of two main options. The first is to play a normal chess game with the standard rules. Both castling and *en passant* moves are acceptable. There are seven levels of play.

Pieces are moved by entering the usual number/letter grid references. Invalid moves will not be permitted and if you are confused the computer will suggest a move.

Choose the death chess option and you are in for a shock. In that mode any attempt to take a piece, by either side, shifts the action to an arcade-style battlefield. There are six settings depending on what pieces are involved. Those are over quickly and swift reactions are needed to win.

Richard Price

DEATH CHESS 5000
Memory: **48K**
Price: **£6.95**
Joystick: **Kempston**
Gilbert Factor: **7**



Four of a kind

YOU MAY THINK there are sufficient chess programs on the market, not to mention 3D Noughts and Crosses. We tend to agree but so far as we know nobody has yet offered four games of skill and strategy under a single heading.

Mind Games from Oasis Software does just that. For an admittedly high price you receive two cassettes containing Chess, Backgammon, Draughts and 3D Noughts and Crosses. Oasis calls the latter Invader Cube in the documentation but the Spectrum knows better and prints 3D-OXO on the screen, so you know where you are.

The Chess program is a version of the successful Dragon Chess implementation. It is not the fastest chess program available but plays a strong game at three levels, with facilities to save games, swap positions, take back four moves, and alter the Spectrum playing style from strategic to tactical.

Backgammon is possibly the weakest of the quartet, not on account of the computer skill level, which played a safe if stolid game, but because of slow response times. That is mainly due to pretty graphics of the dice and the pieces moving but takes so long that such refinements should have been sacrificed to the requirements of speed.

Backgammon is a very fast-moving board game, unlike chess and draughts in that respect, and deserves a correspondingly fast program, or much of the pleasure is lost.

The programs are good value if you do not already have them in your collection and would certainly make a good buy for any newcomer.

Chris Bourne

MIND GAMES
Memory: **48K**
Price: **£14.95**
Gilbert Factor: **7**

Low level high-flyer

WHY any self-respecting pilot should want to fly a jet fighter at high speed through a built-up area a mere 10 or so feet from the ground is difficult to understand but that is the premise behind **TLL** from Vortex Software.

You are the idiot who has opted for the mission, of course, and your aircraft is the Tornado. You have to take off from a runway and seek six enemy targets represented by small discs. Unfortunately for your health the only way to destroy the targets is to skim above them, thus putting you in the embarrassing situation of risking collision with trees or telegraph poles.

Vortex claims to have produced the best-ever graphics. Such claims should be disregarded on principle but the picture of the town in which the game takes place is beautifully detailed in quasi-3D perspective; the representations of the buildings solid and attractive; and the screen scrolling is absolutely smooth and flicker-free.

The Tornado is less impressive but casts a shadow on the ground which, while irritating at first, becomes very useful as a guide to your altitude and precise position. There is the mandatory display of fuel gauge, altimeter, time elapsed and so on, as well as a map of the playing area and a small outline of your position and any targets or solid objects nearby.

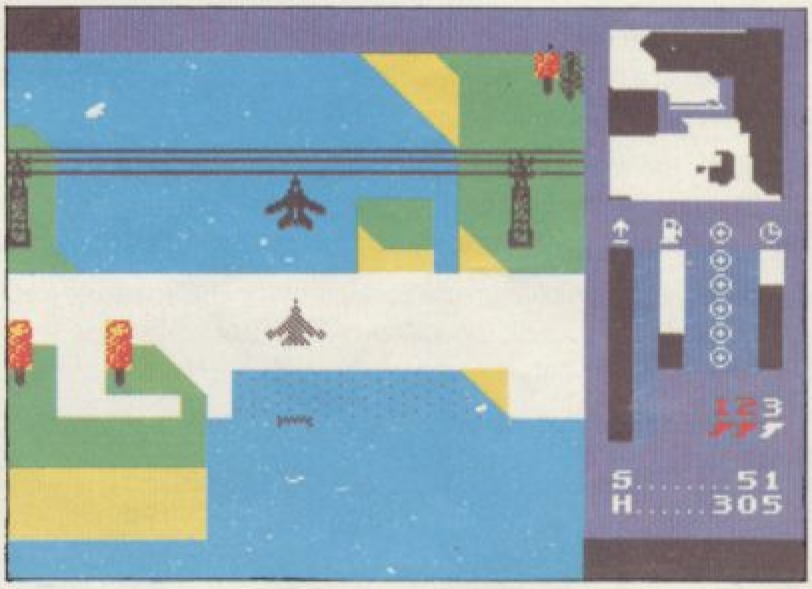
Because the graphics are so highly-developed, the operating system for the Tornado is simple and cannot be described as a simulation. You cannot accelerate or decelerate except by changing the attitude of your swing wings, and take-off and landing is a matter of pressing the appropriate button at the proper time, although obtaining a good approach to the runway for landing is more difficult.

Fuel is limited and there is usually only sufficient time to destroy two targets at most before being forced to land and refuel.

It all adds up to an exciting game, requiring fast reflexes and cool nerve, and if you think you are made of the right stuff, try flying under the telephone lines without panicking. TLL is no picnic.

Chris Bourne

TLL
Memory: **48K**
Price: **£5.95**
Joystick: **Sinclair**
Gilbert Factor: **8**



Barrels of fun

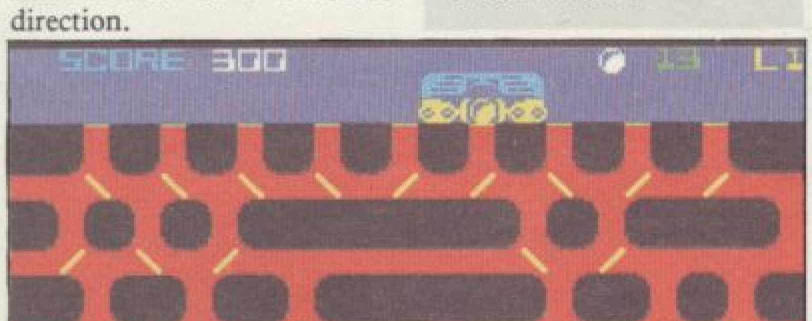
STRATEGY GAMES are rarely programmed to the same standard as arcade games but the new Quicksilva release, **Gatecrasher,** combines an elegant concept with slick graphics. In the game you must drop barrels — they look more like marbles on the screen — down a maze and attempt to fill nine boxes at the bottom of the screen. The maze contains a number of flip-flop baffles which deflect the barrels along different paths. Each time a barrel hits a flip-flop the flip-flop reverses, so that the next barrel will be sent in a different direction.

At later levels you must not only fill all the boxes but also arrange them in the correct order. Each one is numbered and dropping a barrel in a box will swop its number with the one to the right. Since you have only 20 barrels you must plan carefully to complete the task.

Gatecrasher is extremely challenging and a welcome break from alien-bashing.

Chris Bourne

GATECRASHER
Memory: **48K**
Price: **£6.95**
Joystick: **Kempston**
Gilbert Factor: **7**



Roo lacks punch

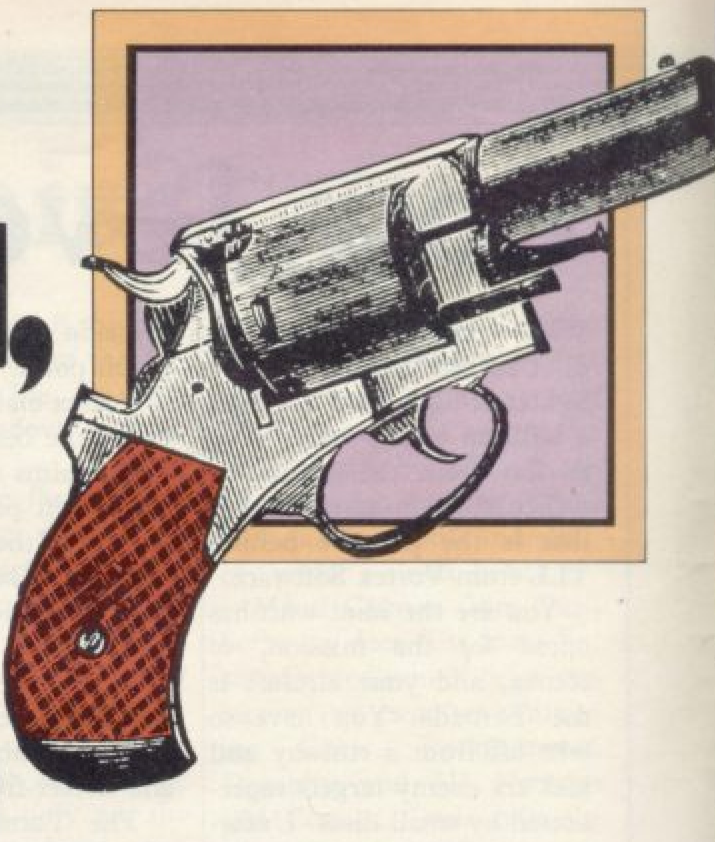
MICROMANIA has raided the zoo again for ideas for its new game **Kosmic Kanga.** In it you control a Kangaroo, that moves along a scrolling landscape. By controlling the height of its bounces you can pick up objects and points, and try to avoid low-flying planes and ducks. To help you in that you can throw the traditional kangaroo boxing gloves at them.

The action is smooth and all the sprites large and colourful. Controlling the kangaroo is rather haphazard and consequently zapping anything becomes a matter of luck as well as skill. When the sprites meet the colours clash very badly. Of 11 screens eight are the same with different sprites for variety.

All in all the game holds your attention for an hour or so but after that the interest wanes. There are many arcade games for the Spectrum, some good and some bad. At best this one is average. Nice graphics, shame about the game.

John Lambert

Kosmic Kanga
Memory: **48K**
Price: **£5.95**
Joystick: **AGF, Protek, Kempston, Sinclair**
Gilbert Factor: **5**





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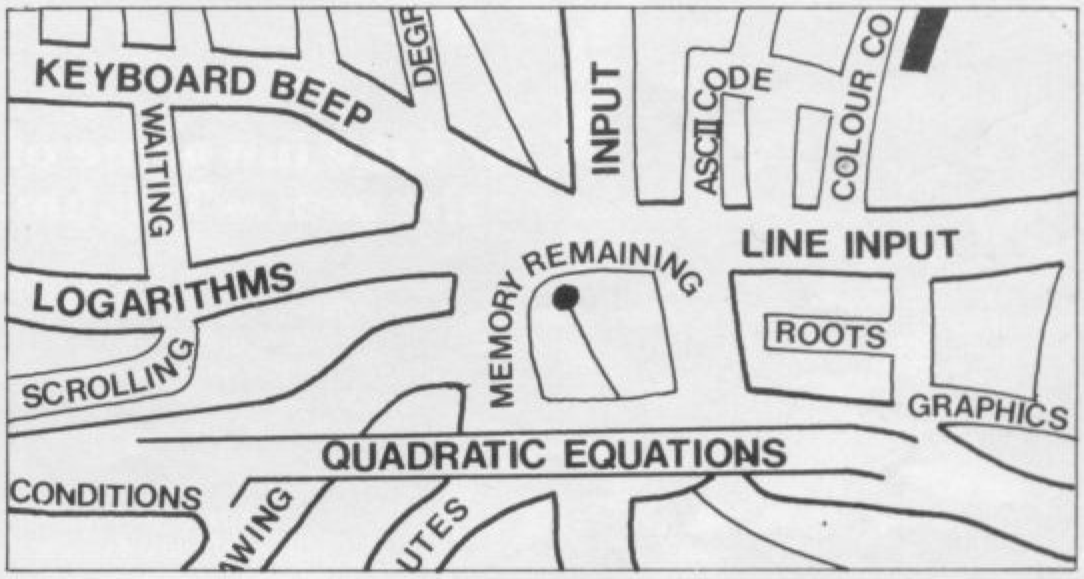
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Simon Lewis presents some useful suggestions to give your Spectrum extra programming power

Routine bytes— a Basic guide



SINCLAIR USER has received hundreds of enquiries this year regarding individual programming problems but those problems are not so exceptional as many might think. They are from users who have passed the stage of reading the Spectrum manual and who find difficulty when they are trying to write programs.

The article forms an easy reference guide of hints and tips designed to combat most of the common problems which have been experienced. The routines cover most of the aspects of computing, including graphics, input, structured programming and mathematics. It is not an exhaustive guide but will help most users.

Keyboard beep

When the Spectrum is first switched on, pressing any key produces a short, sharp click. The length of the sound can be adjusted by POKEing a number between 0 and 255 into memory location 23609 — the higher the number, the longer the sound. The best values are between 50 and 100. Anything shorter than that is inaudible and anything longer means that the Spectrum is still beeping while you are trying to press the next key.

Capitals lock

To put the Spectrum into CAPS LOCK mode in a program, use POKE 23658,8. To get the machine out of CAPS LOCK mode, use POKE 23658,0.

Waiting

The most logical way to perform the wait sequence is:

```
10 PRINT "Press any key to continue"
20 IF INKEY$="" THEN GO TO 20
30 CLS: PRINT "This would be page 2"
```

A simpler way, however, would be to use the PAUSE n facility which tells the computer to wait for n/50 seconds before continuing.

If n=0, that means PAUSE for ever. A PAUSE can always be cut short by pressing a key.

Attributes

Looking at the memory map — page 165 of the manual — it can be seen that the attributes area is located between 22528 and 23296. It occupies 23296–22528=768 bytes, one byte for each of the 24*32=768 character squares on the screen. An attribute byte is arranged as follows:

If a particular function is to be set, the appropriate bit is set to binary 1. If the function is to be off, the bit is set to 0. The resulting byte can then be converted into decimal using the computer BINary facility.

Of the three colours green, red and blue, the other five available colours can be made:

Black: Green off, Red off, Blue off=BIN 000=0
Magenta: Green off, Red on, Blue on=BIN 010=2
Cyan: Green on, Red off, Blue on=BIN 101=5
Yellow: Green on, Red on, Blue off=BIN 110=6
White: Green on, Red on, Blue on=BIN 111=7

Notice how the decimal equivalent of the binary code is the same as the colour number on the keyboard.

Bit	7	6	5	4	3	2	1	0
Function	Flash	Bright	Paper green	Paper red	Paper blue	Ink green	Ink red	Ink blue

Changing attributes

Using the ATTR function it is possible to read the value of the attributes at a given position — line, column. Statements such as LET ATTR (2,2)=56, however are not allowed.

A method of loading a specified attribute into a given position, using the standard line, column format would be useful. The following function will do that:

DEF FN a(y,x)=22528+32*y+x

Do not forget that this must have a line number. To illustrate its use, try this program:

```
10 DEF FN a(y,x)=22528+32*y+x
20 FOR f=1 TO 704: PRINT "&";: NEXT f: REM fill screen
30 INPUT "Attribute=";value; "Line=";line; "Column=";column
40 POKE FN a(line,column), value
50 GO TO 30
```

Permanent attributes

A complete change of screen attributes is often required and it can be achieved with lines such as

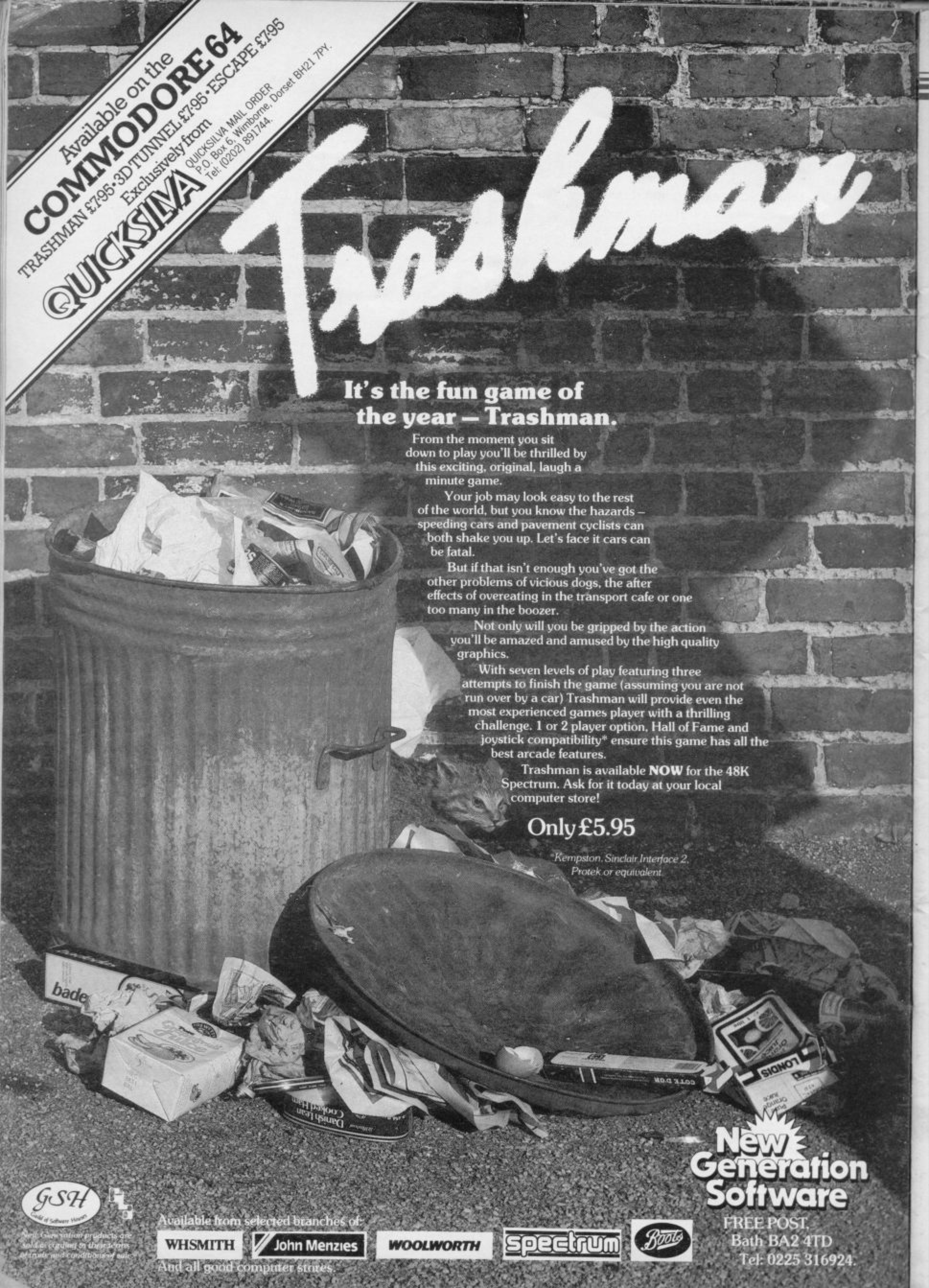
```
50 PAPER 1: INK 6: FLASH 0: BRIGHT 1: CLS
```

A memory-saving way of achieving the same effect is to evaluate what this attribute would be. In this case, it would be BIN 01001110=78. The number is then POKEd into address 23693 and followed by a CLS to load the value into the attributes bytes for the upper half of the screen.

Scrolling

A scroll can be achieved easily in a program by using the statement LET a=USR 3280. To get the screen to scroll when a PRINT statement is encountered, use POKE 23692,x where x

continued on page 45



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is one less than the number of lines to be scrolled. For example:

```
10 INPUT "No. of times to scroll=";n: REM n cannot be greater than 254
20 FOR f=1 TO 22: PRINT: NEXT f: REM move print position to bottom of screen
30 POKE 23692,n+1: REM n scrolls
40 FOR f=1 TO n+10: PRINT f: NEXT f
```

Drawing

When DRAWing on the Spectrum, the distance is specified as displacements horizontally and vertically from the last point plotted. The DRAW command on many other computers is different; the parameters following the command specify the co-ordinates of the point to be DRAWn to. If you prefer the latter method, there are two simple solutions:

Have a subroutine in the program which will convert the co-ordinates specified into displacements and DRAW with these. For example:

```
10 PLOT 20,30
20 LET x=100: LET y=80: GO SUB 9000
30 DRAW x,y,2: DRAW -x,-y,2
40 STOP
9000 LET x=x-PEEK 23677: LET y=y-PEEK 23678: RETURN
```

Or use the definable functions:

```
10 DEF FN x(h)=h-PEEK 23677
20 DEF FN y(v)=v-PEEK 23678
30 PLOT 20,30
40 DRAW FN x(100), FN y(80)
```

The disadvantage with that method is that the FNs have to be typed-in every time you wish to DRAW.

Permanent attributes

Permanent attributes for the lower half of the screen are stored at location 23624, the value of the byte being calculated in the same way as before. The colour of the screen border is taken as being the paper colour, irrespective of whether it is flashing or bright.

Input

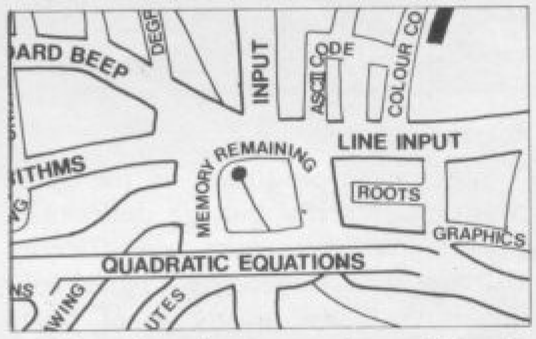
Assuming black ink, white paper and a white border, the line 10 INPUT INK 2; PAPER 6;"What is your name?";a$ will result in the prompt written only in red ink on yellow paper; the string input will be in black ink on white paper.

How can both the prompt and the string input be in red on yellow? The answer is to POKE address 23624 with the required attribute — in this case BIN 00110010=50 — and then perform the INPUT. There is just one small problem remaining. The border colour will change only to the specified paper colour after the first key of the input is pressed. It is necessary therefore to set the border to the required colour before INPUTting, as in this program:

```
10 BORDER 0
20 POKE 23624,132
30 INPUT "What is your name?";a$
```

Line input

When INPUTting using the LINE statement the computer does not print the surrounding quotation marks, although it knows they are there. How, therefore, do you STOP a program which is using LINE input? If STOP is typed, it will become the value of the string.



The only solution to the problem is to type cursor down — CAPS SHIFT/6 — when asked for input. That does not need to be the first character typed and will give error H (STOP in INPUT).

Printing on lower half

This is accomplished by following the PRINT command with #0. This program shows its use more clearly:

```
10 FOR f=1 TO 20
20 PRINT #0;f
30 PAUSE 20
40 NEXT f
50 PAUSE 0
```

Notice how the screen behaves as in INPUT. The whole of the lower half scrolls up to make room for the next PRINT, which is then done on the bottom line. Line 50 of the program is necessary, as a report code destroys the lower half of the screen. PRINT #0;AT behaves similar to INPUT AT. If more than 22 lines are printed on the bottom half, then error 5 — Out of screen — occurs.

Degrees, radians and gradians

Degrees are by far the most popular and most convenient units of angle. There are 360 degrees in a circle, that number being chosen because it will divide exactly by as many numbers as possible.

Radians are the most convenient units for more advanced mathematics. There are 2*PI radians in a circle. They are the units the Spectrum uses. Gradians are an attempt to metricate degrees. A right angle — 90 degrees — contains 100 gradians. There are 400 gradians in a circle. Gradians are little-used now.

Common angles and the equivalent in other units are shown in the table:

The best way to convert between them is to set up some two-letter constants. The first letter defines the units in which the angle is measured and the second is the units to which the angle is to be converted. That can be done in one line:

```
10 LET rd=180/PI: LET dr=PI/180: LET rg=200/PI: LET gr=PI/200: LET dg=10/9: LET gd=.9
```

Suppose the result of a trigonometric operation was 0.7854 radians. To convert it to degrees, the conversion factor would be the variable rd — conversion from radians to degrees. Telling the computer to PRINT 0.7854*rd gives 45 degrees approximately. To find the sine of 30°, use PRINT SIN (30*dr). If gradians are not required, it is just as easy to use the definable functions:

```
10 DEF FN d(r)=r*180/PI: DEF FN r(d)=d*PI/180
```

Degrees	Radians	Gradians
360	6.2831853	400
270	4.712389	300
180	3.1415927	200
90	1.5707963	100
45	0.78539816	50
60	1.0471976	66.66˙
30	0.52359878	33.33˙

Roots

To find, for example, the cube root of 27, use PRINT 27↑(1/3) To find the fifth root of 7776, use PRINT 7776↑(1/5). In general, n↑(l/r) finds the rth root of n.

Quadratic equations

As anyone studying for O level will be aware, the general equation for a quadratic is $ax^2+bx+c=0$. The formula will have two solutions, given by the following equations:

$$r1 = \frac{-b+\sqrt{b^2-4ac}}{2a}$$

continued on page 46

continued from page 45

$$r2 = \frac{-b-\sqrt{b^2-4ac}}{2a}$$

They can be mimicked by the user-defined functions:

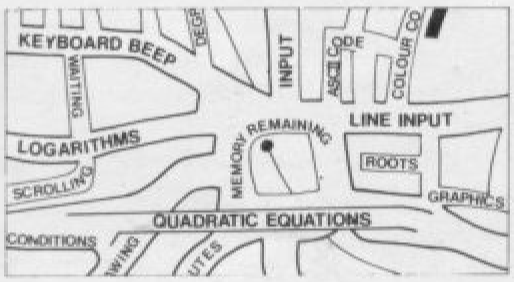
DEF FN x(a,b,c)=(−b+SQR (b*b−4*a*c))/(2*a)
DEF FN y(a,b,c)=(−b−SQR (B*b−4*a*c))/(2*a)

where FN x(a,b,c) and FN y(a,b,c) are the two roots. If b*b is less than 4*a*c, error A — Invalid Argument — occurs which indicates a quadratic equation whose roots are imaginary or not real.

Logarithms

The Spectrum calculates logarithms to base e, which has the approximate value of 2.72; the proper answer can be obtained by PRINT EXP 1. To convert the logarithm of a number to a specified base is what the user-defined function in line 20 of this program does:

10 INPUT "Number=";n,"Base=";b



20 DEF FN l(n,b)=LN n/LN b
30 PRINT "Log of ";n;" to base ";b;"=";FN l(n,b)
40 GO TO 10

Memory remaining

When writing long programs, it is useful to know how much memory remains. The following defined function will give the amount of memory occupied by the Basic program and any variables. RUN the program first to set these up.

5 DEF FN k()=(PEEK 23641+256*PEEK 23642−PEEK 23635−256*PEEK 23636)/1024

The display file in the Spectrum occupies 24*32*8=6144 bytes. The attributes area occupies 24*32=768 bytes. The total amount of memory used by the display is therefore 6144+768=6912 bytes.

The user-defined graphics occupy 21*8=168 bytes; the system variables occupy 180 bytes; the printer buffer is 256 bytes long; together, they occupy 7,516 bytes, leaving 8,868 bytes remaining, say about 8½K to the user for variables and Basic program in the 16K Spectrum and about 40½K in the 48K version.

Do not forget that the function gives memory occupied by the program; to get the amount of free memory use PRINT 8.5−FN k() on the 16K Spectrum or PRINT 40.5−FN k() on the 48K version.

ASCII Code

ASCII — American Standard Code for Information Interchange — is the usual method of allowing computers to talk to peripherals, e.g., printers, and other computers. The code contains only characters between CHR$ 32 and CHR$ 127 inclusive. The other codes are non-standard Spectrum-only codes.

The point is, however, that SCREEN$ will detect only ASCII characters; it will not detect graphics characters or the user-defined graphics. In appendix A of the programming manual, CHR$ 92 is incorrect; it should be a diagonal line from top left to bottom right. As printed, it is identical to CHR$ 47.

Conditions

The logical conditions on the Spectrum are powerful but are under-used because of the more user-friendly IF . . . THEN statements. Logical conditions have the advantage of faster execution than IF . . . THEN statements. For example, the two lines

50 IF x=5 THEN LET y=0
60 IF x=3 THEN LET y=12

can be replaced by the single line

50 LET y=(0 AND x=5)+(12 AND x=3)

Logical conditions are specially useful in fast-action games. For example:

100 IF INKEY$="8" THEN LET p=p+1
110 IF INKEY$="5" THEN LET p=p−1
120 IF p>31 THEN LET p=31
130 IF p<0 THEN LET p=0
140 REM process this information here
150 GO TO 100

Lines 100-130 can be quite easily replaced by:

100 LET p=p+(INKEY$="8")−(INKEY$="5")+(p<0)−(p>31)

Colour control characters

The best control characters to use in a listing are flashing on/off, bright on/off and inverse/true video, as they do not affect the colours of the ink and paper. Do not forget to switch them off at the end.

They can be incorporated into strings to prevent having to use statements like PRINT PAPER 2; INK 5; FLASH 1;a$ but bear in mind that each control character occupies two character spaces. So, for instance, typing LET a$=CHR$ 16+CHR$ 2+CHR$ 18+CHR$ 1+"DANGER"+CHR$ 18+CHR$ 0+CHR$ 16+CHR$ 0 and then PRINT a$ gives 'DANGER' in flashing red. Telling the computer to PRINT LEN a$ gives 14: 6 for the letters and 2 each for the four control codes.

Another problem is string slicing. If you try PRINT a$(2 TO), the Spectrum gives a black question mark, followed by 'DANGER' in flashing black. That is because the first character to be PRINTed — CHR$ 2 — is interpreted as such and not as the number for the ink. The Spectrum does not know how to interpret CHR$ 2 so it PRINTs a question mark.

Graphics and text

The Spectrum is very flexible in the way text and graphics can be mixed freely on the screen. Because of the layout of the screen, however, care must be taken not to PRINT, PLOT or DRAW in the wrong place, as that can affect the colours of nearby characters and graphics.

The following user-defined functions will convert PLOT to PRINT AT positions and vice versa:

DEF FN x(c)=8*c
DEF FN y(1)=(21−1)*8
DEF FN c(x)=INT (x/8)
DEF FN 1(y)=21−INT (y/8)

The abbreviations used are:
1: line
c: column
x: x co-ordinate of pixel
y: y co-ordinate of pixel

The pixel accessed is the one at the bottom left of the character square. This program illustrates a use for two of those functions:

10 DEF FN x(c)=8*c: DEF FN y(1)=(21−1)*8
20 FOR c=2 TO 30 STEP 2
30 LET 1=c/2+3
40 PRINT AT 1,c; FLASH 1;"+"
50 PLOT FN x(c)−1, FN y(1): DRAW 0,8: DRAW 9,0: DRAW 0,−9: DRAW −9,0
60 NEXT c

The list is probably by no means exhaustive. It is merely an attempt to pass on useful information to other Spectrum users; you probably have several tips that you can add to it. It is little points of this kind which permit you to squeeze a little more from your Spectrum.

The Space Saver Station

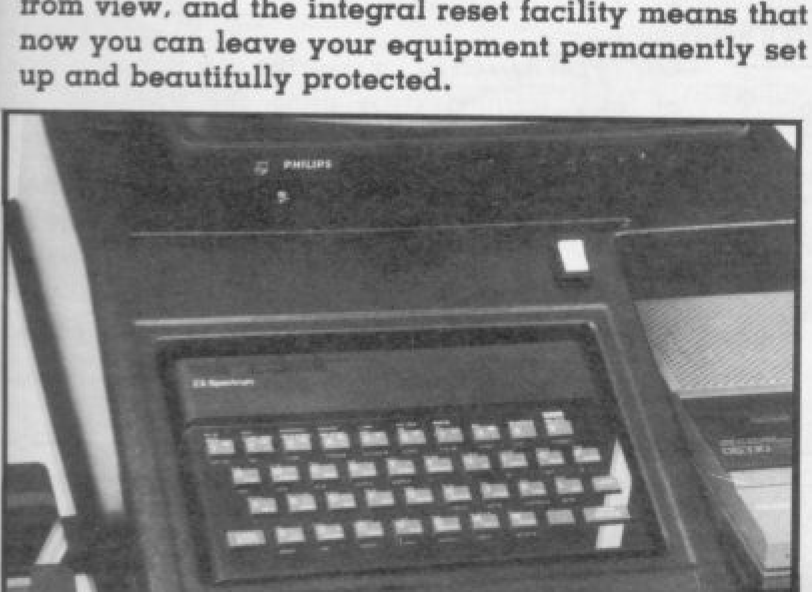


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Lowering the Jolly Roger

Software pirates steal over £100m a year. Michael Spencer shows how to protect your programs from the scourge of the silicon seas

PIRATES are costing the software games industry millions of pounds a year. The scale ranges from the copies circulating in schools and computer clubs to the large-scale commercial deception of passing pirated copies for sale. Each copy made of a computer game robs a company or individual of the revenue which might have derived from a legitimate sale.

From sales comes profit; from profit the cash to develop more ideas. The life of a game may be shortened by months as the number of illegal copies increases. After all, who will refuse the chance to obtain a copy of a sought-after game at a fraction of the cost? It has happened extensively in the record industry, as we all know.

You may be considering writing or even selling a computer game. A bit of effort now may prevent you being caught by the software pirates and also avoiding any infringement of the copyright laws. There are ways and means to make it less than easy, but not impossible for the software pirate.

There are no mechanisms supplied by manufacturers in the home computer market which will give any security. In the commercial market there are methods to hinder the pirates. One way is to put a serial number in the issued software. That is possible with high-cost, low volume sales. The solution cannot be applied to the low-cost, high-volume domestic games market. The cost of doing so is far too high.

To protect your creation from the pirate is neither easy nor completely effective. 'Tape copiers' advertised in many home computer magazines can usually defeat the protection which is possible. The copiers are advertised as a means of making personal security copies but nobody is naive enough to believe that is why they are being sold.

Software houses and individuals have produced a few mechanisms which will make it difficult for the majority of computer users to pirate a copy for their friends. For the most popular home computer, the Spectrum, we detail ways in which you can protect your work and avoid copyright problems.

The simplest method is to hide the program from prying eyes. For a Basic program the INK and PAPER colour can be set the same within the program lines, usually white, so that a listing will not be seen. To do that it is necessary to use a control character in a program line. A colour item is followed by a colour number to set the PAPER or INK white. CHR$16 is the colour item for ink and CHR$7 the colour number for white. Conveniently they are obtained by setting the Spectrum into Extended mode (E) and pressing SHIFT 7.

Take the first line of the program down to the editing area. After the line number, press the sequence of keys which will give the effect INK 7. To make doubly sure that you will have the effect you are seeking it is useful to insert the control characters for PAPER white, too.

Putting the Spectrum into E mode and pressing just 7 — do not press the SHIFT key as well — will do that. The line may have vanished previously; setting the PAPER white will ensure that it does. On returning the line to the program by pressing ENTER, the rest of the program lines on the screen will vanish as well. That may well mean that the rest of the program will be invisible but if you have used control characters later the effect may be reversed.

Inserting a line that is not removed easily and will identify the program as yours is the next useful thing you can do. Normally the line numbers on the Spectrum run from 1 to 9999. You can create a line 0 which has the interesting property of being difficult to remove. The first line of any Basic program can be turned into a line 0. Create a line such as

```
10 REM COPYRIGHT PERRY SUSBY
```

Determine the start of the Basic program area by typing

```
PRINT PEEK 23635+256 * PEEK 23636
```

That will give a value which is usually 23755, the address of the start of the Basic program area. It will point to the first line of your program. Each line of a Basic program is different internally from that seen on the television screen. The first two bytes are the line number. For the line numbered 10 the first of the two bytes will be 0, the second 10. To change the line number to 0, type;

```
POKE 23755,0:POKE 23756,0
```

That will overwrite the line number already held and the line will appear as line 0. It cannot be removed by editing or deleting. The only way to remove it is to POKE a line number in the range 1 to 9999 to it and then remove in the normal way. Combine this technique with the 'invisible program' and it may well prove sufficiently effective to deter some would-be pirates.

The most popular way of protecting software in use is Break protection. Normally BREAK is used to stop the computer when running a program or when using a printer or cassette recorder. When a program is stopped by BREAK it can then be listed and, of course, copied. On the assumption that a program which cannot be broken cannot be copied, break protection has gained wide acceptance but tape copiers will still work — all they do is copy the tape.

There are two methods to consider. The first is to alter one of the system variables which controls the screen size in the lower part of the screen. That variable is DF SZ — define screen size — and is at the address 23659. Address 23569 usually holds the value 2. That can be confirmed by typing

```
PRINT PEEK 23659
```

If you put in a line in your program such as

```
250 POKE 23659,0
```

the program will be break-protected. A program protected by that method cannot use the lower two lines of the

screen. INPUT is one of the commands affected by the restriction. Also if the program prints out so many lines that the request SCROLL? is seen, the system will set DF SZ back to 2 and the break protection will be lost.

Programs protected in that way will have to use keyboard scanning to pick up user input — hint, use INKEY$. What is typed in will need to be echoed back to the screen so that the user can see what has been typed. Given that these problems are taken into account when the program is being written, the technique is sound. If break is pressed during normal running the Spectrum will crash and lock up. The only way to re-set the system is to power on and off.

The second and equally simple method is to corrupt the variable ERR SP, the pointer to the item on the machine stack to be used as an error return. BREAK is a user-introduced error in the running program. Other errors are, for example:

2 VARIABLE NOT FOUND
C NONSENSE IN BASIC.

When BREAK is pressed a report will be seen saying "BREAK INTO PROGRAM" and will give the line and statement number last interpreted.

All those messages are held in ROM and are used by the system when an error is detected. An error routine is entered and the appropriate report given. If you corrupt the return address to be used in the event of an error, the Spectrum will crash, as it is directed to another totally incorrect byte. To do that PEEK the address of ERR SP, thus:

```
LET A=PEEK 23613+256 * PEEK
23614
```

That will be done in your program, as it is only possible to apply the break protection from an already running program.

Having found the value of A, POKE a value to it. Some values will not work; try using values such as 100, 150, 200 or 255. The value 200 is effective and causes a NEW. Results will vary depending on the value chosen. Choose one which erases the program when break is pressed. Put the line POKE A,200 — 200 being one of the effective values — in the program to do it.

To make effective use of ERR SP a program must be totally bug-free. Once break-protected, any software errors will cause the Spectrum to crash. The program must be tested thoroughly.

The other aspect is that the item on the machine stack is mobile. It will move up and down the stack as GOSUBs are entered and left. For a program which uses GOSUB, the PEEK and POKE lines will need repeating in each GOSUB. The original contents of the address A will have to be kept and POKEd back before the RETURN at the end of each GOSUB. If that is not done the program will crash when trying to return from the GOSUB.

All that can be rather tedious and can add a fair overhead in code. One advantage is that the method will allow normal input, unlike the DF SZ method. The disadvantage is that if the user enters incorrect characters to an INPUT the Spectrum may detect an error and crash. It is best to pick up any input

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Illustration: Stuart Briers

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as character and do any necessary conversion in the program.

The use of break protection implies that the program is already running and the user does not have to issue a RUN command. It would be pointless to issue a program which needed RUN typed in by the user. Once it is realised that the program is break-protected, all that is needed is a LIST to see what is there. A program can be saved in such a way that once re-loaded it does an automatic GOTO. The line

SAVE "program" LINE 200

does that. Note that LINE is a keyword — below key 3. That will work only for LOAD and not MERGE. Using MERGE, a program which has been saved with the LINE qualifier can be loaded and it will not re-start.

A second far less known method is to save the Basic program as bytes and not as a program in the normal way. Parts of the memory can be saved using the CODE qualifier. Only the start address and the number of bytes to save to tape need be known. For example, the line

SAVE "name" CODE 34000,200

will save 200 bytes of memory starting from address 34000. Note that CODE, like LINE, is a keyword and can be found above the I key. The start of the program area is pointed at by the contents of the system variable PROG but it is more sensible to save, starting from the start of the system variables. That is fixed at address 23552.

From that point the block of memory up to the address pointed at by STK END can be saved. That is the start of the 'free space'. So that the program will start automatically it will have to save itself. The next line after the SAVE line will have to be a GOTO line, which is obeyed when the program is loaded. In the program the following lines are used:

```
8000 SAVE "name" CODE 23552, A-23552
8010 GOTO NN
```

A is the value of system variable STK END which has to be PEEKed to determine this. Use this line:

```
LET A=PEEK 23653+256 * PEEK 23654
```

The value A is the location of that start of the free space. Calculate the number of bytes to save between the start of the system variables and the start of the free space. Once saved, the program is re-loaded using

LOAD "name" CODE

It is not necessary to specify the numbers when loading. The program will start and obey the line which follows the SAVE line.

The point about the method is that the program begins to run immediately and break protection can be applied swiftly. Inclusion of the system variables is an additional form of protection to prevent interference with the loading process. Another advantage is that if the system variable ERR SP is changed before the SAVE command in the program, the re-loaded version will be protected during the loading process. That is done by the line:

POKE 23613,200:POKE 23614,200

just before the SAVE. That usually will result in a system crash but poking ERR SP is less predictable than poking the item it points to on the machine stack. That item is used as an error return back to a specified byte which can be chosen for consistent results.

This method is also effective against headerless load copiers. Normally the 17-byte header created on the tape just before the program contains the load starting information. As the program has been saved as bytes, the header will show only the start address and number of bytes. Once loaded, the program will start anyway.

Almost all games sold today are in several parts on a cassette tape. A large proportion, particularly the arcade games, are written in machine code. Many others have machine code parts. A typical cassette tape may contain a Basic loader program which will load a SCREEN$ file; load machine code as bytes; and load data as bytes.

A tape with several components is difficult to pirate. It is possible to chain two Basic programs so that the first which loads a SCREEN$ file — which gives the player something to look at during the loading process — can also load a second bigger program. Use the method which saves the program as bytes for the second program as well as the first, so that they both start automatically.

A SCREEN$ file can also cover up the details of the components on the tape — set the paper and ink white. Setting the paper and ink white is also useful when the SCREEN$ is being loaded. It will not appear until the load reaches the attributes.

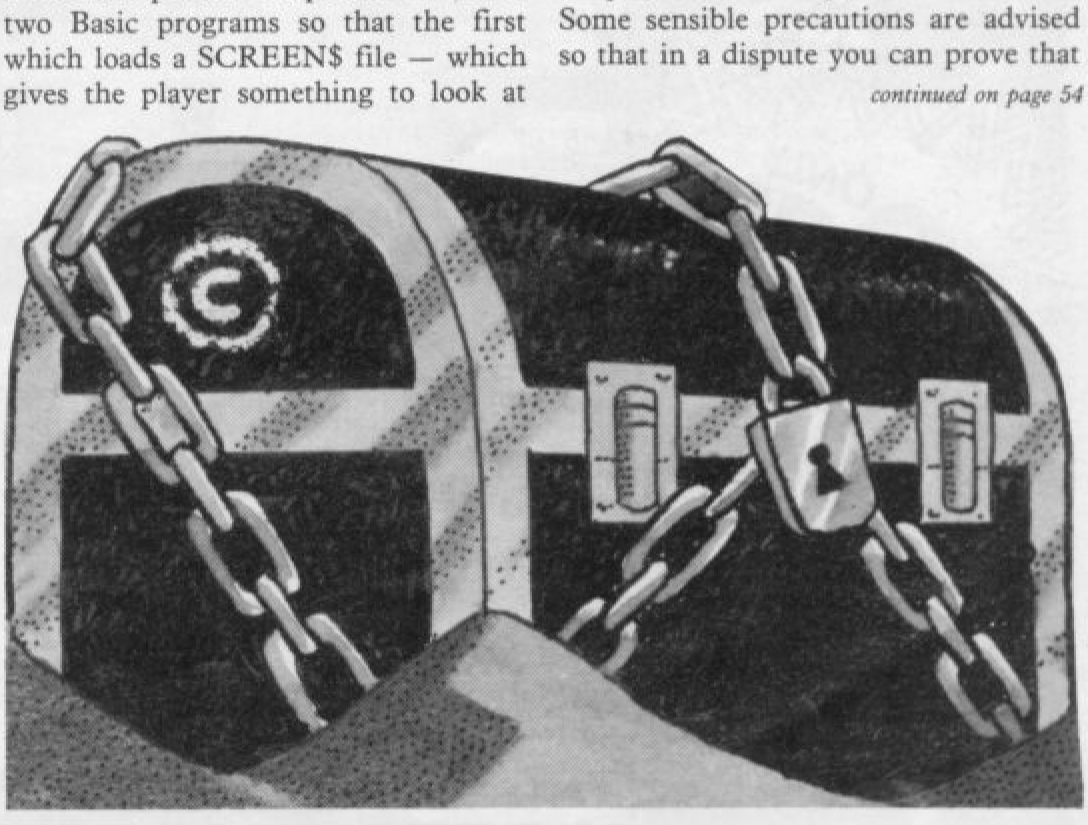
All the above methods are technical solutions to the problem of software piracy. While Copyright Acts will not prevent someone copying your game, you will have some form of legal redress.

The principle of copyright protection under the 1956 Act is that the protection is afforded automatically as soon as the original work is created. To qualify, the work must be recorded in some material form by a person entitled to do so. In the U.K. that means a British subject, a person resident in the U.K. or a U.K. company. The copyright belongs to the creator of the work.

Copyright entitles the person to control the publishing, reproduction and broadcasting of the work. Copyright can be disposed of as if it were property. If you have been asked to create an original work by an employer or are under contract to do so, the copyright may belong to the person who asked you to do the work. Copyright protection exists for the life of the creator and 50 years thereafter.

Obtaining copyright protection is simple; no formal registration is needed. Some sensible precautions are advised so that in a dispute you can prove that

continued on page 54



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the work is yours. Send a copy to your bank manager, solicitor or your professional association. Ask for a dated receipt. Even simpler, post the work to yourself by registered post and leave it unopened on receipt.

The internationally recognised way of identifying a work as one having copyright protection is to mark it with the copyright symbol, an encircled C or the word 'Copyright' followed by the name of the creator and the date of first publication. For example, Copyright Perry Susby 1984.

Your work has to be original to qualify for copyright protection. With that in mind make sure that you have not copied from someone else. Consider the use of names, logos, music, utilities, screen generators and compilers. Do not use a popular name to enhance your game, for example, the name of a well-known cinema spy or a famous product.

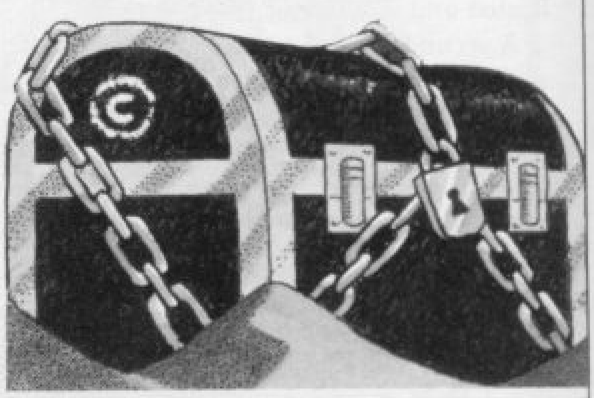
There are registered trade marks and names you must never use. Do not try to associate your game with anything commercial; companies will sue. The danger in using music to brighten a game are not easily apparent. The infringement is that you, if you copy a musical work, will be reproducing it. Even such a well-known tune as that of 'Happy Birthday' has copyright protection. Music of composers long dead may be protected under copyrighted arrangements with the arrangers enjoying protection under the Act.

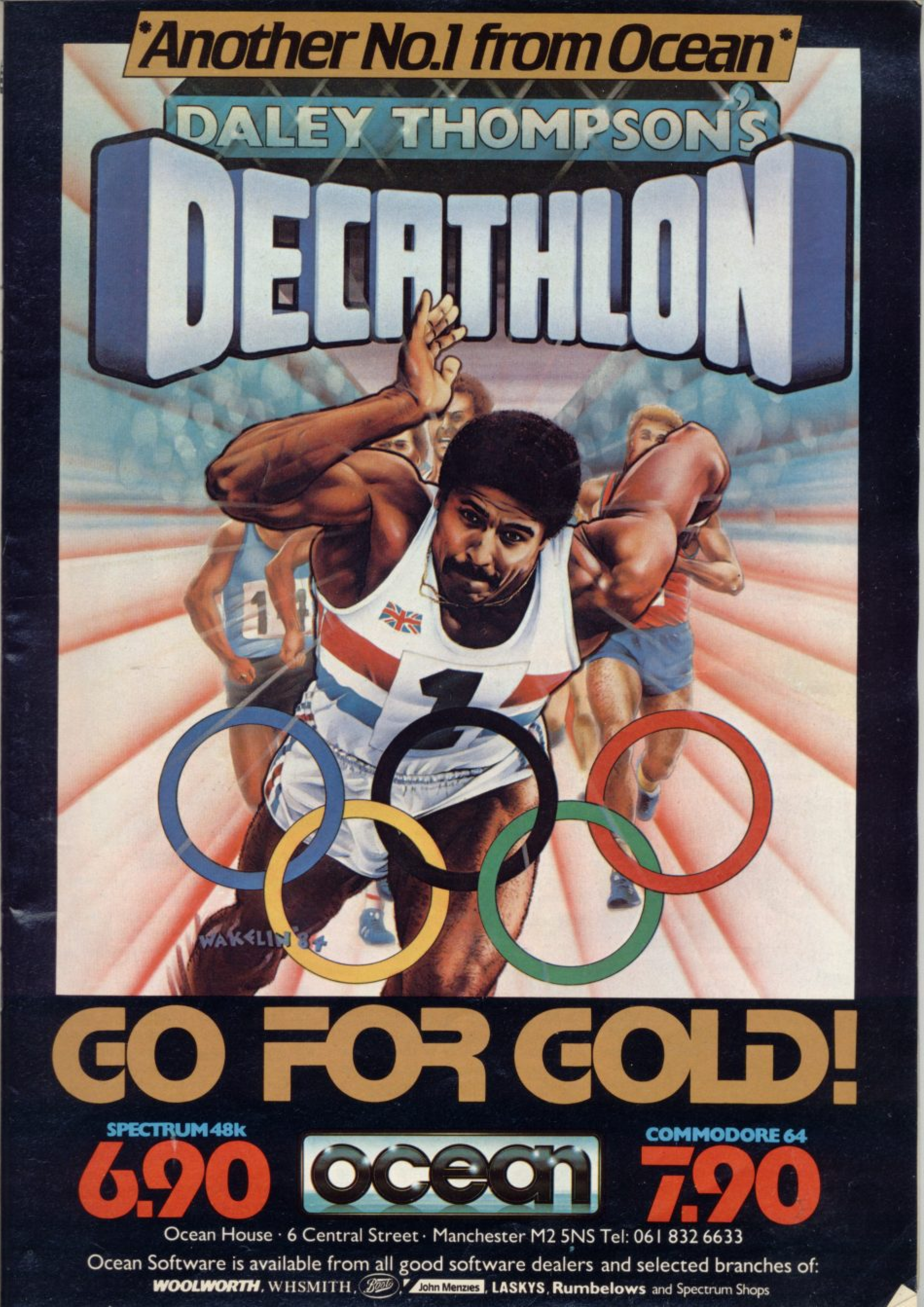
Do not be under the misapprehension that traditional music is not copyright; almost all of it is. If you want to use a musical work, contact the publisher before doing so and expect to pay a royalty. The basis for a royalty calculation is usually a percentage of the dealer price, less tax, or a percentage of the revenue from the sale of the game. The rate may be eight percent or so. That is a hefty amount to pay, so unless you are convinced that the inclusion of a copyright tune will add value to your game, it is probably best to write your own.

If you find a tune and do not know by whom it was published or who owns the copyright, write to the Mechanical Copyright Protection Society Ltd, Elgar House, 41 Streatham High Road, London SW16 1ER which will be able to help.

There are a number of utilities, compilers and screen generators on the market which can make the task of writing a game simpler and may produce a better end result. If it is apparent that such a tool made the writing of your game possible, check with the originator, particularly if your game contains lines not written by yourself. Some such products state that their use in a game requires an acknowledgment on the cassette and on the promotional material. Err on the side of caution and check with the writers of the programming aid you are using.

Above all, do not copy other games. At best, you will be accused of a lack of originality, at worst taken to court. Remember that companies and individuals already established will have sufficient money to take legal action and you may have insufficient funds to defend yourself. Remember that the key to success is originality.




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Not just a load of old rubbish



The humble dustman is the hero of a new game Chris Bourne tells how Malcolm Evans found brass in muck

THE NEW GENERATION was born shortly before D-Day in 1944, a few hundred yards downwind of Romford Brewery in Essex. In fact, there were two of them — twin brothers Malcolm and Rod Evans. "We moved to Portsmouth when we were about 18 inches old", says Rod, "and lived there for the next 20 years."

Rod joined the world of finance with the listening bank. Brother Malcolm took a sandwich course in electronics and joined Marconi, where he worked on high-powered projects such as satellite technology. In the mid-70s he moved to Smiths Aviation, where he became involved more closely with computers, designing hardware to implement computer control systems for jet engines.

In 1979 he moved again, to Sperry Gyroscope in Bristol, joining its microprocessor applications group. There he found himself using Z-80 and 8088 machine code language for small applications of a classified nature for the Ministry of Defence.

The Bristol factory was closed in 1981 but by then Malcolm had his own ZX-81, bought for his birthday by his wife Linda. He still retains strong feelings about the quality of the machine. "It is more flexible than the Spectrum, because you can do much more on the screen, using re-location techniques. Everyone complained about the screen when it first appeared but in fact it was an advantage."

By the time he left Sperry Gyroscope, Malcolm had already written **3D Monster Maze,** motivated solely by a desire to explore the capabilities of the machine. "Games were not big business then," he says. "I wrote a game because a game can stretch a computer to its limit — your imagination is the limit. Computers solve problems; writing a game creates the problem."

At that time Malcolm was a keen classical guitarist and played occasionally in folk clubs locally. At a club meeting in Bristol he met John Greye, who was also writing games for the ZX-81, and the two of them decided to form J K Greye Software Ltd. Malcolm took 3D Monster Maze to a ZX Microfair and the game sold well. "I was pleasantly surprised," he says, "probably because I had not seen many other games."

A lucky coincidence won the new company an order from W H Smith. "Smiths had already trashed the game

we sent them," says Malcolm, "but product manager John Rowland overheard a small boy praising it at the fair and came to see us."

Two weeks after Malcolm had left his job Smiths ordered the game, along with **1K Breakout** and **3D Defender.** In the spring of 1982 Greye and Malcolm decided to go their separate ways and Malcolm founded New Generation Software. The company obtained one of the first Spectrums in June of that year and continued the 3-D theme with **Escape, Knot in 3D** and **3D Tunnel.**

The concept of perspective graphics was a central feature of New Generation games. "I define 3-D as moving forwards and seeing objects pass you. It gives the player an extra dimension," Malcolm says.

In April, 1983 Malcolm found the scale of the operation becoming too much for one man to handle and invited Rod to join the business, bringing his financial and business expertise to bear on the administrative side of the outfit. Rod was then working as retail manager of the Scotch House, an up-market clothing store in London, having left banking some years earlier. He had grown to dislike London and gave up the big city for the relative peace of Bath, where New Generation is based.

Trashman, the latest and certainly the greatest success New Generation has had, represents a new departure for the company. "We had been producing games we thought the public wanted," says Rod, "but they appealed mainly to the 15-plus age group. Trashman was a deliberate attempt to increase our market coverage. We wanted to appeal to the whole family."

He says the company used to have a cult following. "John Menzies, the retailer, told us 'People are buying games by Malcolm Evans and New Generation, probably in that order'. We did not think the cult was what we wanted."

They decided to work out exactly what made a good game. "If I told you what we decided you could go and write games yourself," says Rod, "but originality — and the feeling you must go on further to reach the next level — were high on the list."

Since the game was to have a family appeal, the subject had to be domestic — no space wars or fantasy monsters. The idea for basing a game on rubbish and a dustman was one of those flashes of inspiration people have in unlikely places — such as the bath. Unfortunately we cannot reveal what Malcolm was doing when he thought of Trashman.

Instead of using 3-D graphics, Malcolm decided to have what he calls an 'isometric view', a plan view of the streets with the houses in a quasi-3D perspective. That permits the player to see such things as the dog running after the dustman or the cyclists careering along pavements. The game was worked out to the last detail before any of the programming began.

"I did not find it too difficult," says Malcolm. "The first screen with just one house took a week and then we added shadows and other details."

A great deal of attention was paid to details. "The whole game has to entertain," says Rod. "Quotes were put in for non-players to read and enjoy the humour. There are 34 altogether." Even the colour of the houses was not left to chance. "I mean, here we are in Bath. Sinclair yellow was not good enough for Bath stone, so it had to be red." That attention to detail has also won New Generation an award, the French Grand Prix International Du Logiciel D'Adventure for best graphics animation.

In Trashman, the dustman has to collect a number of bins from a street at each level; hazards include cars, vicious dogs, and even your own dustcart driver. Malcolm is already planning a sequel, which will have an international flavour. At the end of Trashman you are awarded the diploma of the Academy of Trashmanship, winning the right to dispose of rubbish round the world. The sequel will build on that theme, as the dustman travels — paying his own way — to exotic locations with the sole intention of collecting rubbish. Malcolm promises plenty of inventive visual humour to suggest concepts of 'foreign rubbish' and says the game will be finished in September.

Other projects include a cartoon adventure with cartoon-style humour and moving pictures, and a Fireman game, where you have to rescue people and save buildings from destruction. "Not exactly rescuing Esmerelda," says Rod, "but . . .".

The company is run from a converted coach house in Malcolm's back garden. Lest you think he lives in a manor house, he does not. The coach house is very small and the main house is situated in a leafy suburb of Bath. The company is finding its picturesque premises cramped and plans to move in the near future. Another indication of expansion is the hiring of two young programmers to write new games and convert existing software to new machines — "We do not buy programs; we prefer to hire good programmers".

Outside of work, Malcolm has no hobbies. He is a true workaholic who throws himself completely into any project on which he is engaged. Past enthusiasms include astronomy — six hours a night bent over a telescope — and guitar playing. Since starting New Generation, he claims not to have played the guitar at all — Rod has now borrowed it to learn music. Likewise, although Malcolm has few computer games in his house, businessman Rod is a great enthusiast for **Jet-Pac** from Ultimate.

Malcolm's wife Linda, also a director of the company, says her husband's single-minded determination can become irritating at times "but there is usually a slack period just after a game has been launched when I can get him to mow the lawn — although he suffers from hay fever."

Malcolm has no regrets about leaving the world of satellites and defence projects. "I found working for someone else very frustrating," he says. "I could not meet the deadlines and also do what I wanted to do. New Generation does not feel like work at all and it gives me more freedom."

Whether 14-hour days can be construed as freedom is a matter of conjecture but there is no doubt that Malcolm and his clan are delighted with the results.



Malcolm at work

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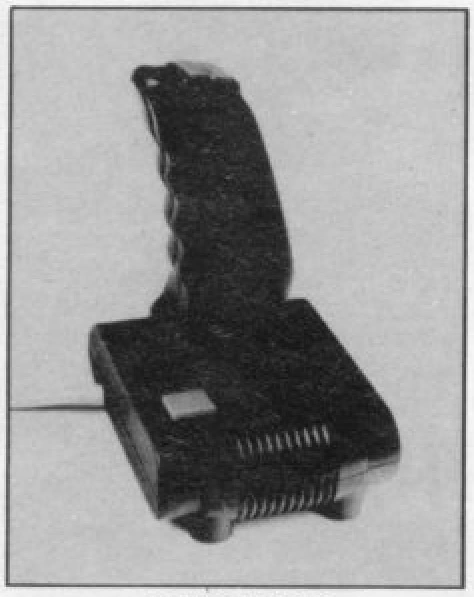
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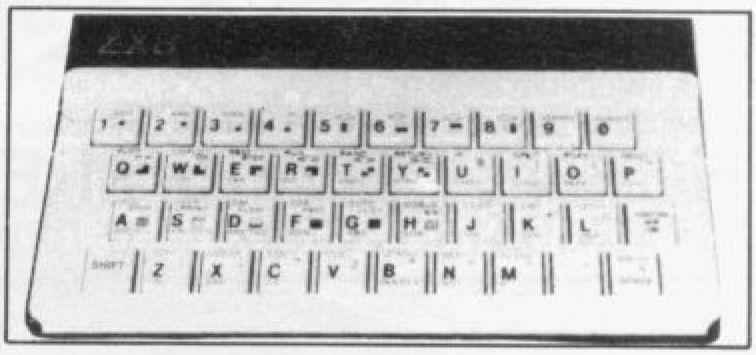
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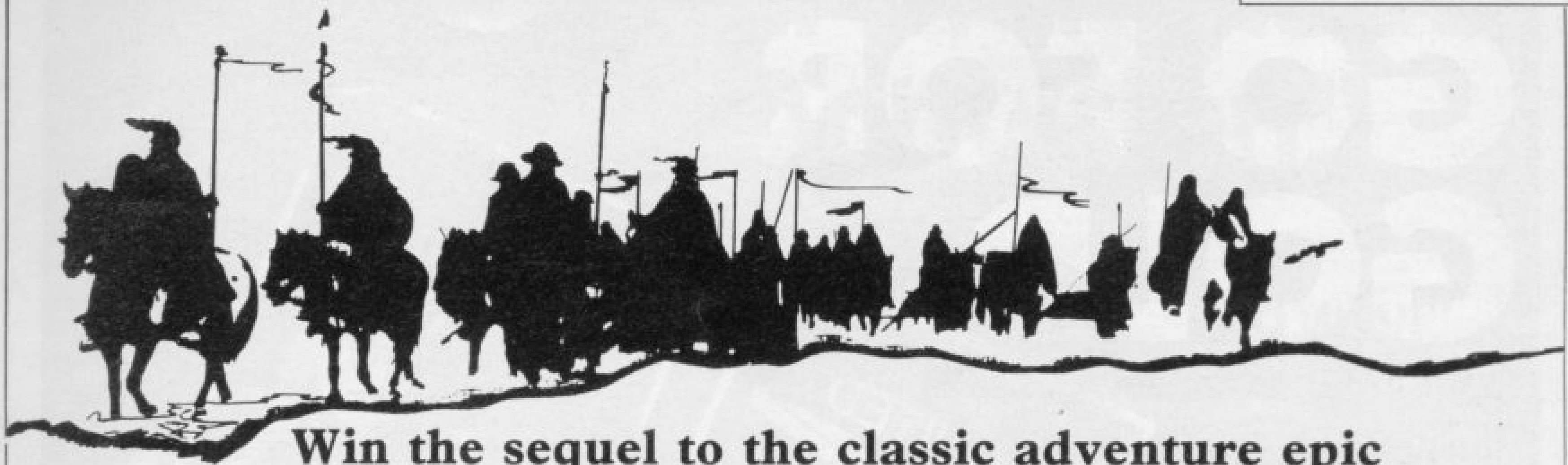
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Lord Luxor's fearsome adversary may have been killed at the end of the first saga, slain by Luxor's own sword at the bloody battle outside Ushgarak, but his spirit lives on. Revenge lies in the hands of his witchdaughter, Shareth the Heartstealer, and she has smuggled Luxor's son Morkin through the Icegates into her own realm of Icemark.

Lord Luxor manages to breach the Frozen Gates with Corleth and Rorthron and just 200 warriors, and embarks on his quest to defeat the Ice Empress.

Dwarfs, who have left ancient underground tunnels, Giant races and other strange creatures inhabit this world and they owe no allegiance to Luxor.

If Luxor should fail, then the task falls to Tarithel the Dreamer, daughter of Midnight's Lord of Dreams, who has also entered through the Ice Gate and is out to rescue Morkin from his cold enchantment.

The Spectrum version of **Doomdark's Revenge** is due for release in October but the winner of next month's exclusive *Sinclair User* competition will win a cassette of the adventure together with a framed painting depicting the Land of Icemark. This beautiful map, specially commissioned for the competition, will be the one on which the adventure of **Doomdark's Revenge** is based.

Twenty-five runners-up will win cassettes of **Doomdark's Revenge** and a further 25 entrants will win copies of **Spellbound,** the exciting pyramid game from Beyond Software. Everyone who enters will receive a discount voucher redeemable with Beyond Software.





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PROGRAM PRINTOUT

GRAPHICS INSTRUCTIONS

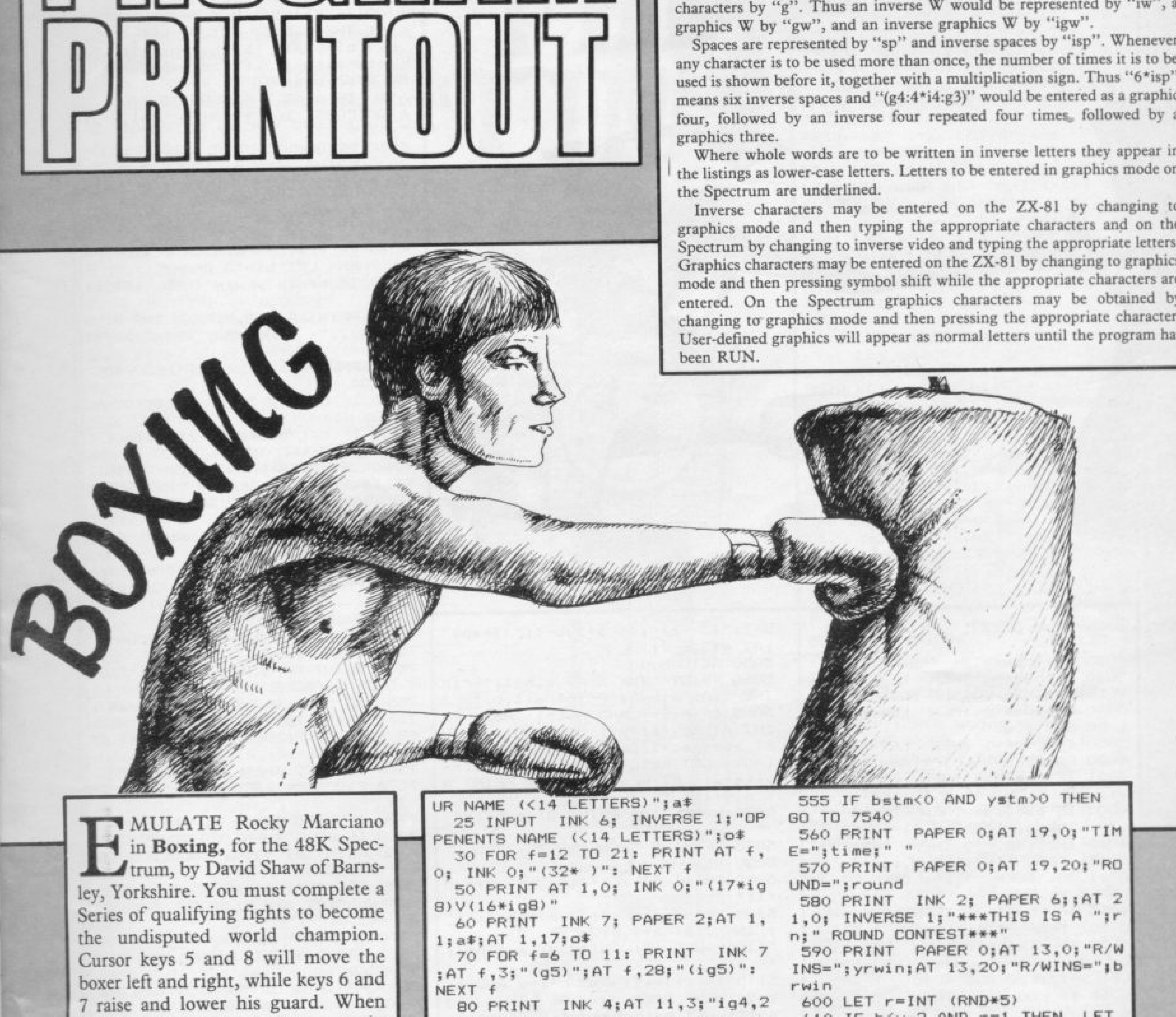
Instructions for graphics characters are printed in lower-case letters in our listings. They are enclosed by brackets and separated by colons to distinguish them and the brackets and colons should not be entered.

Inverse characters are represented by the letter "i" and graphics characters by "g". Thus an inverse W would be represented by "iw", a graphics W by "gw", and an inverse graphics W by "igw".

Spaces are represented by "sp" and inverse spaces by "isp". Whenever any character is to be used more than once, the number of times it is to be used is shown before it, together with a multiplication sign. Thus "6*isp" means six inverse spaces and "(g4:4*i4:g3)" would be entered as a graphic four, followed by an inverse four repeated four times, followed by a graphics three.

Where whole words are to be written in inverse letters they appear in the listings as lower-case letters. Letters to be entered in graphics mode on the Spectrum are underlined.

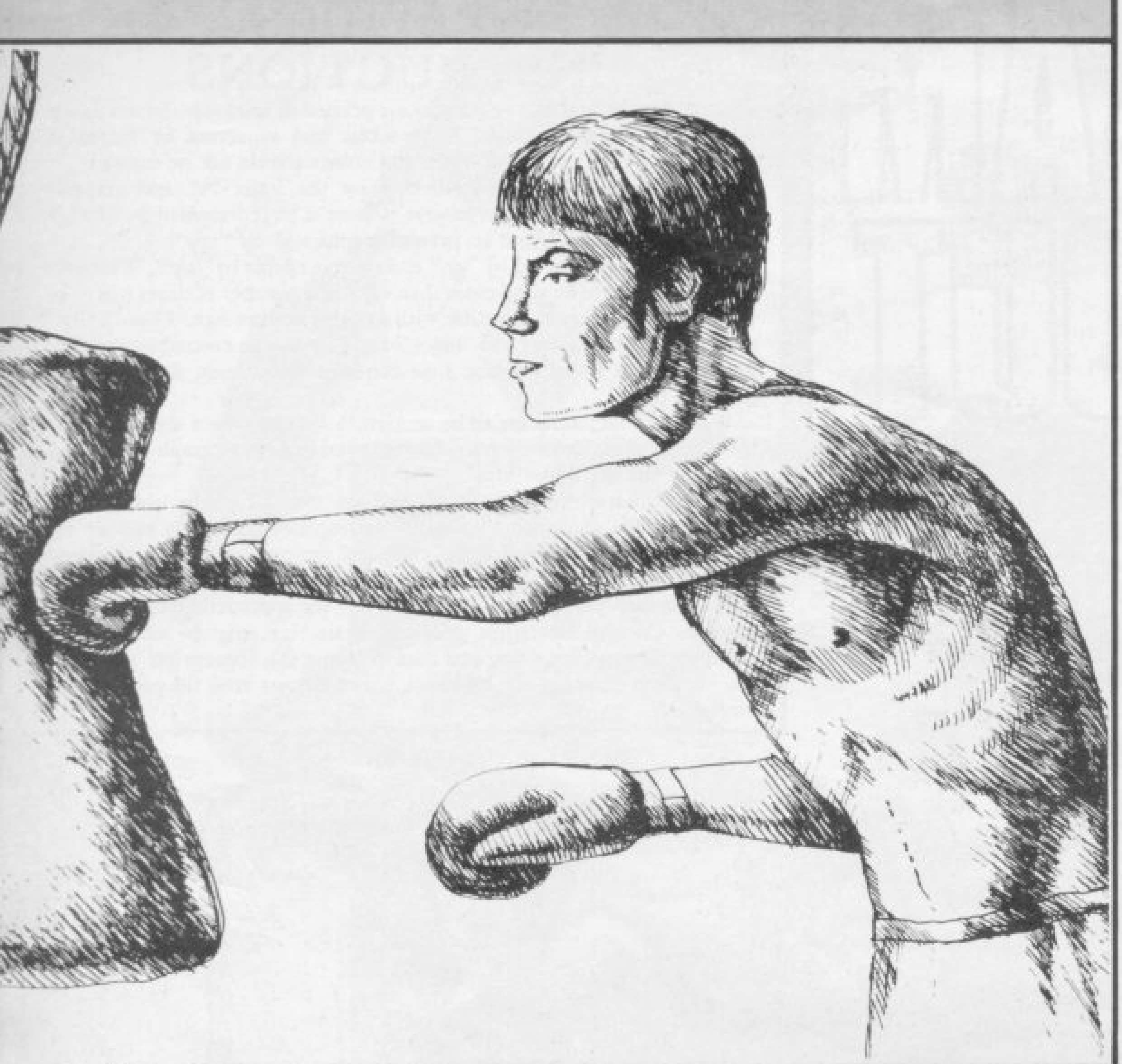
Inverse characters may be entered on the ZX-81 by changing to graphics mode and then typing the appropriate characters and on the Spectrum by changing to inverse video and typing the appropriate letters. Graphics characters may be entered on the ZX-81 by changing to graphics mode and then pressing symbol shift while the appropriate characters are entered. On the Spectrum graphics characters may be obtained by changing to graphics mode and then pressing the appropriate character. User-defined graphics will appear as normal letters until the program has been RUN.



EMULATE Rocky Marciano in **Boxing,** for the 48K Spectrum, by David Shaw of Barnsley, Yorkshire. You must complete a Series of qualifying fights to become the undisputed world champion. Cursor keys 5 and 8 will move the boxer left and right, while keys 6 and 7 raise and lower his guard. When the guard is up, press key 1 to punch, but key 2 when the guard is down.

```
   1 BORDER 0: PAPER 1: BRIGHT 1
: INK 6: CLS : LET cf=9
   2 LET time=0: LET x=7: LET y=
16
   3 LET round=1: LET asc=0: LET
 bsc=0
   5 LET yrwin=0: LET brwin=0: L
ET yrsc=0: LET brsc=0
   6 LET ydef=0: LET punch=0: LE
T hit=0: LET arm=0: LET barm=0
   8 LET bi=0: LET di=0
   9 PRINT AT 11,12; FLASH 1;"UB
OXERI": PAUSE 50
  10 CLS : LET a=7: LET b=11
  11 INPUT  INVERSE 1; INK 3;"Nu
mber of Rounds (1-15)";rn
  12 IF rn>15 OR rn<1 THEN  BEEP
 1,-20: GO TO 11
  15 LET ystm=rn*10: LET bstm=rn
*20
  20 INPUT  INVERSE 1; INK 2;"YO
UR NAME (<14 LETTERS)";a$
  25 INPUT  INK 6; INVERSE 1;"OP
PENENTS NAME (<14 LETTERS)";o$
  30 FOR f=12 TO 21: PRINT AT f,
0; INK 0;"(32* )": NEXT f
  50 PRINT AT 1,0; INK 0;"(17*ig
8)V(16*ig8)"
  60 PRINT  INK 7; PAPER 2;AT 1,
1;a$;AT 1,17;o$
  70 FOR f=6 TO 11: PRINT  INK 7
;AT f,3;"(g5)";AT f,28;"(ig5)":
NEXT f
  80 PRINT  INK 4;AT 11,3;"ig4,2
4*g3,g7"
 100 PRINT  INK 2;AT a,b;"A"
 110 PRINT  INK 3;AT a+1,b;"B"
 120 PRINT  INK 4;AT a+2,b;"C"
 125 PRINT  INK 3;AT a+3,b;"D"
 200 PRINT AT x,y;"G"
 210 PRINT AT x+1,y;"H"
 220 PRINT AT x+2,y;"I"
 230 PRINT AT x+3,y;"J"
 300 PRINT AT 20,8; PAPER 6; INK
 0;"FIGHT NUMBER:";cf
 500 IF cf<2 THEN  PRINT AT 0,0;
 INVERSE 1; INK 3;"*WORLD*UNDISP
UTED**CHAMPIONSHIP*"
 510 PRINT  PAPER 0;AT 15,0;"R/s
core=";yrsc;" ";AT 15,20;"R/scor
e=";brsc;" "
 520 IF cf>1 THEN  PRINT  INK 5;
AT 0,0; INVERSE 1;" CHAMPIONSHIP
 QUALIFYING FIGHT  "
 530 PRINT  PAPER 0;AT 17,0;"STA
MINA=";ystm;" "
 540 PRINT  PAPER 0;AT 17,20;"ST
AMINA:";bstm;" "
 550 IF ystm<0 AND bstm>0 THEN
GO TO 7500
 555 IF bstm<0 AND ystm>0 THEN
GO TO 7540
 560 PRINT  PAPER 0;AT 19,0;"TIM
E=";time;" "
 570 PRINT  PAPER 0;AT 19,20;"RO
UND=";round
 580 PRINT  INK 2; PAPER 6;;AT 2
1,0; INVERSE 1;"***THIS IS A ";r
n;" ROUND CONTEST***"
 590 PRINT  PAPER 0;AT 13,0;"R/W
INS=";yrwin;AT 13,20;"R/WINS=";b
rwin
 600 LET r=INT (RND*5)
 610 IF b<y-2 AND r=1 THEN  LET
y=y-1: PRINT AT x,y;"  ";AT x+1,
y;"  ";AT x+2,y;"  ";AT x+3,y;"
 ": GO TO 620
 620 IF y<27 AND r=3 THEN  LET y
=y+1: PRINT AT x,y-2;"  ";AT x+1
,y-2;"(3*sp)";AT x+2,y-2;"(3*sp)
";AT x+3,y-2;"3*sp)": GO TO 630
1000 IF INKEY$="1" AND arm=1 THE
N  LET ystm=ystm-1: GO SUB 5060
1010 IF INKEY$="2" AND arm=2 THE
N  LET ystm=ystm-1: GO SUB 5090
1020 IF INKEY$="6" THEN  LET arm
=2: LET ydef=2: GO SUB 5130
1030 IF INKEY$="7" THEN  LET arm
=1: LET ydef=1: GO SUB 5150
2010 IF INKEY$="5" AND b>4 THEN
 GO SUB 5000
2020 IF INKEY$="8" AND b<y-2 THE
N  GO SUB 5030
3000 LET barm=INT (RND*3)
3010 IF barm=2 AND punch=1 THEN
 GO SUB 6000
3020 IF barm=1 AND punch=2 THEN
 GO SUB 6090
```

continued on page 68



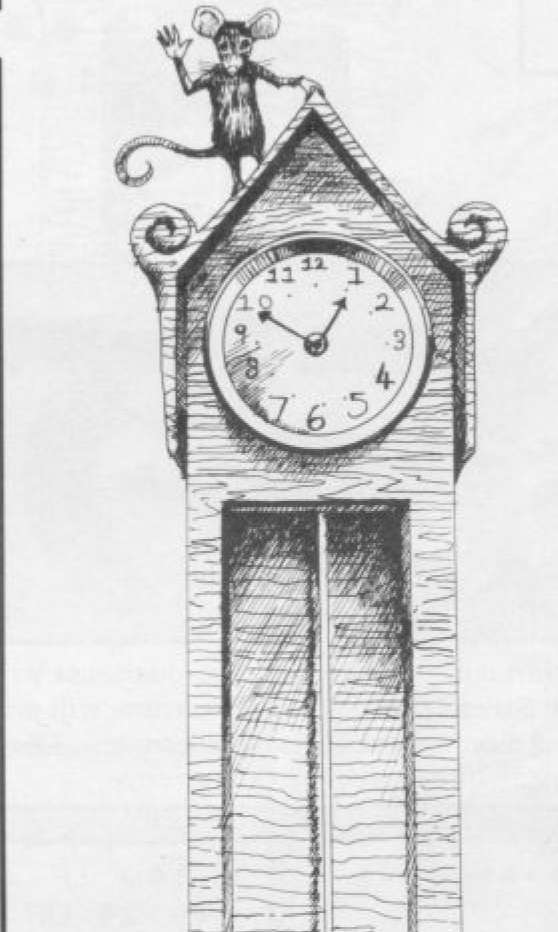
continued from page 67

```
3025 LET bdef=INT (RND*3)
3030 IF bdef=2 THEN  LET punch=1
: LET hit=2: GO SUB 6030
3040 IF bdef=1 THEN  LET punch=2
: GO SUB 6060
3050 IF bdef=1 THEN  LET hit=1
4000 PAUSE 10: LET time=time+1
4001 IF asc>bsc THEN  PRINT AT 5
,1; INK 6;"U";AT 5,30;" "
4002 IF bsc>asc THEN  PRINT AT 5
,30; INK 6;"T";AT 5,1;" "
4010 IF time>=70 THEN  PRINT AT
1,13; FLASH 1;"(ig8,M,ig8)": BEE
P .1,30: BEEP .1,20: BEEP .1,30:
 BEEP .1,20
4015 IF time>=70 THEN  FOR f=0 T
O 50: BEEP .1,f: NEXT f
4020 IF time>=70 THEN  LET time=
0: LET round=round+1: LET b=16:
LET y=17: GO SUB 4040
4025 IF round>rn THEN  GO TO 700
0
4035 GO TO 4100
4040 IF yrsc>brsc THEN  LET yrwi
n=yrwin+1
4050 IF brsc>yrsc THEN  LET brwi
n=brwin+1
4060 IF yrsc=brsc OR brsc=yrsc T
HEN  LET yrwin=yrwin+1: LET brwi
n=brwin+1
4070 LET yrsc=0: LET brsc=0
4075 CLS : GO TO 50
4080 RETURN
4110 GO TO 100
5000 LET b=b-1
5001 PRINT AT a,b;"  ";AT a+1,b;
"(3*sp)";AT a+2,b;"(3*sp)";AT a+
3,b;"  "
5010 LET st=INT (RND*3)
5011 IF st=2 THEN  LET ystm=ystm
-1
5020 RETURN
5030 LET st=INT (RND*3): LET b=b
+1: IF st=1 THEN  LET ystm=ystm-
1
5031 PRINT AT a,b-1;"  ";AT a+1,
b-1;"(3*sp)";AT a+2,b-1;"(3*sp)"
;AT a+3,b-1;"   "
5050 RETURN
5060 PRINT  INK 3;AT a,b+1;"E";
INK 2;AT a,b+2;"F";AT a+1,b;"B "
5065 IF b+2=y AND hit=1 THEN  PR
INT AT x,y+1;"Q": BEEP .01,10: L
ET asc=asc+1: LET di=di+1: LET b
i=0:: LET bstm=bstm-1: LET ystm=
ystm+2: LET yrsc=yrsc+1: PRINT A
T x,y+1;" "
5070 PAUSE 10: PRINT AT a,b+1;"
 "
5075 IF di>5 THEN  GO TO 7700
5080 RETURN
5090 PRINT AT a,b+1;" ";AT a+1,b
+1;" "
5100 PRINT  INK 3;AT a+1,b+1;"E"
; INK 2;AT a+1,b+2;"F"
5110 PAUSE 10: PRINT AT a+1,b+1;
"  "
5115 IF a+1=x+1 AND b+2=y AND hi
t=2 THEN  BEEP .01,10: LET asc=a
sc+1: LET bstm=bstm-1: LET bi=0:
 LET di=di+1: LET ystm=ystm+2: L
ET yrsc=yrsc+1
5116 IF di>5 THEN  GO TO 7700
5120 RETURN
5130 PRINT  INK 2;AT a+1,b;"F";
INK 2;AT a+1,b+1;"B"
5140 RETURN
5150 PRINT  INK 3;AT a+1,b;"B";
INK 2;AT a+1,b+1;"F";AT a,b+1;"F
"
5160 RETURN
6000 PRINT AT x,y-2;"LK";AT x+1,
y-1;" H": LET bstm=bstm-1
6005 IF y-2=b AND ydef=2 THEN  P
RINT AT a,b-1;"N": BEEP .05,0: L
ET bsc=bsc+1: LET di=0: LET bi=b
i+1: LET bstm=bstm+2: LET ystm=y
stm-1: LET brsc=brsc+1: PRINT AT
 a,b-1;" "
6010 PAUSE 10: PRINT AT x,y-2;"
 ";AT x+1,y-1;" H"
6015 IF bi>3 THEN  GO TO 7700
6020 RETURN
6030 PRINT AT x+1,y-1;" H";AT x,
y-1;"L"
6040 LET punch=1
6050 RETURN
6060 PRINT AT x+1,y-1;"LH"
6070 LET punch=2
6080 RETURN
6090 PRINT AT x,y-1;" ";AT x+1,y
-1;" ";AT x+1,y-2;"LK"
6095 LET bstm=bstm-1
6100 IF x+1=a+1 AND y-2=b AND yd
ef=1 THEN  BEEP .01,0: LET di=0:
 LET bi=bi+1: LET bsc=bsc+1: LET
 ystm=ystm-1: LET bstm=bstm+2: L
ET brsc=brsc+1
6110 IF bi>3 THEN  GO TO 7700
6120 PAUSE 10: PRINT AT x+1,y-2;
"  "
6130 RETURN
7000 PRINT  INK 4; PAPER 2;AT 5,
9; FLASH 1;"FIGHT OVER": PAUSE 1
00
7010 IF yrwin>brwin THEN  LET b$
=a$
7015 IF yrwin=brwin OR brwin=yrw
in THEN  LET b$="A DRAW"
7020 IF brwin>yrwin THEN  LET b$
=o$
7030 PRINT AT 12,0;"AND THE WINN
ER IS...": PAUSE 50: PRINT AT 13
,17;b$
7035 PAUSE 0: IF cf<2 THEN  GO T
O 8000
7040 IF b$<>a$ THEN  PAUSE 0: RU
N
7050 IF b$<>o$ THEN  LET cf=cf-1
: PAUSE 0: GO TO 2
7060 IF b$="A DRAW" THEN  PRINT
AT 14,0; FLASH 1;"(7*-)REFIGHT N
ECESSARY(8*-)": GO TO 2
7120 PAUSE 0: RUN
7500 PRINT AT 5,9; FLASH 1;"FIGH
T OVER": PAUSE 100
7510 IF ystm<0 THEN  LET b$=o$
7520 PRINT AT 12,0;"AND THE WINN
ER IS...": PAUSE 50: PRINT AT 13
,17;b$
7525 IF cf<2 THEN  GO TO 8000
7530 GO TO 7040
7540 PRINT AT 5,9; FLASH 1;"FIGH
T OVER": PAUSE 100
7550 IF bstm<0 THEN  LET b$=a$
7560 PRINT AT 12,0;"AND THE WINN
ER IS...": PAUSE 50: PRINT AT 13
,17;b$
7565 IF cf<2 THEN  GO TO 8000
7570 PAUSE 0: LET cf=cf-1: GO TO
 2
7700 IF bi>3 THEN  GO TO 7800
7710 IF di>3 THEN  GO TO 7900
7750 PRINT AT 12,0;"KNOCKDOWN(14
*!)": STOP
7800 PRINT AT a,b;"  ";AT a+1,b;
"(3*sp)";AT a+2,b;"POINT 3*sp)";
AT a+3,b;"  "
7810 PRINT AT a+3,b-4;"NOPEF"
7820 PRINT AT 13,0;o$;" WON BY A
 KNOCKOUT!"
7830 FOR f=0 TO 50: BEEP .01,f:
NEXT f
7835 IF cf<2 THEN  GO TO 8000
7840 PAUSE 0: RUN
7900 PRINT AT x,y;"  ";AT x+1,y;
"  ";AT x+2,y;"  ";AT x+3,y;"  "
7910 PRINT AT x+3,y;"LKSRO"
7920 PRINT AT 13,0;a$;" WINS BY
A KNOCKOUT!": LET cf=cf-1
7930 FOR f=0 TO 50: BEEP .01,f:
NEXT f
7940 IF cf<2 THEN  GO TO 8000
7950 GO TO 2
8000 CLS : FOR f=0 TO 21: PRINT
 INK 2; PAPER 6;AT f,0; INVERSE
1;"THE CHAMPION OF THE WORLD IS.
...": PRINT AT f,0;"(32*sp)": BE
EP .01,f: NEXT f
8050 FOR f=0 TO 21: PRINT AT f,1
0;b$: BEEP .1,f: NEXT f
8060 PRINT AT 21,0; INVERSE 1;"
";b$;" IS THE CHAMP !!!": PAUSE
0
8070 PRINT AT 10,0; INVERSE 1;"
  PRESS KEY FOR ANOTHER GAME    "
8080 PAUSE 0: RUN
8090 STOP
```

TELL THE TIME

TELL THE TIME, from W D Owen of Wrexham, Clwyd, is an educational program for younger children to teach them to tell the time. The screen displays a large clock face and then draws the hands at different positions. You have to say what time it is, entering the minutes first and then the hour.

The program, for the 16K Spectrum, uses special graphics instructions. For an explanation of how to enter these please read the instructions at the beginning of Program Printout before attempting to type in the program.

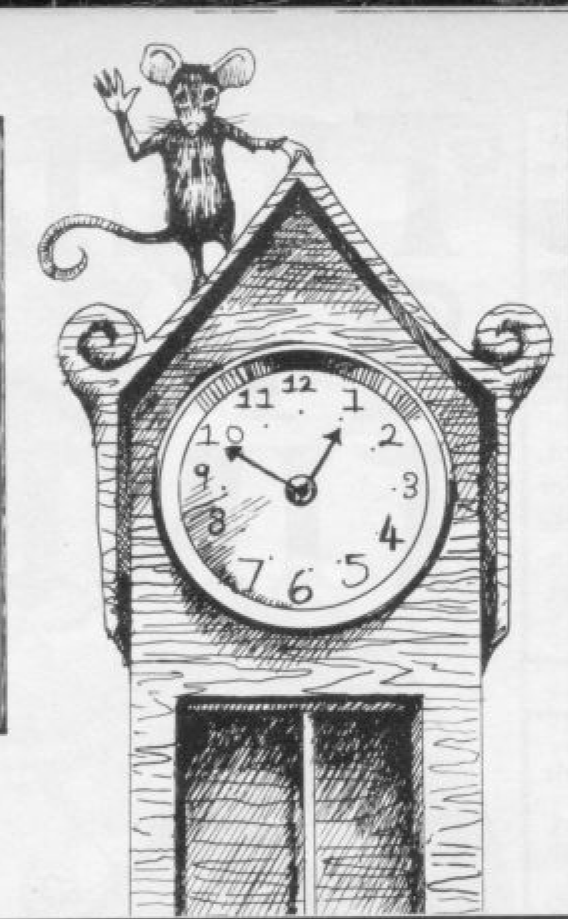



```
8020 CLS
8030 PRINT AT 0,3; INVERSE 1;"WH
AT'S THE TIME BY D.OWEN"
8035 PRINT AT 5,0;"MINUTES ARE I
N STEPS  OF 5 ONLY."
8040 PRINT AT 7,0;"MINUTES  ARE
 TAKEN  AFTER  THE INDICATED HOU
R."
8045 PRINT AT 10,0;"YOU  ARE  AS
KED  TO  ENTER  THE NUMBER OF MI
NUTES AFTER THE HOUR"
8050 PRINT AT 13,0;"NEXT YOU WIL
L BE ASKED TO ENTER THE HOUR."
8055 PRINT AT 16,0;"A RECORD OF
YOUR SCORE WILL  BE KEPT ON THE
SCREEN."
8060 PRINT AT 20,7;"ANY KEY TO C
ONTINUE"
8065 PAUSE 0: CLS
8080 LET score=0
8090 LET sc=0
8100 FOR n=76 TO 80: CIRCLE 127,
95,n: NEXT n
8120 PRINT AT 1,15;"12"
8130 PRINT AT 2,20;"1"
8140 PRINT AT 6,23;"2"
8150 PRINT AT 10,24;"3"
8160 PRINT AT 14,23;"4"
8170 PRINT AT 17,20;"5"
8180 PRINT AT 18,15;"6"
8190 PRINT AT 17,11;"7"
8200 PRINT AT 14,8;"8"
8210 PRINT AT 10,7;"9"
8220 PRINT AT 6,8;"10"
8230 PRINT AT 3,10;"11"
8240 PLOT 127,95
8245 PRINT AT 1,0;"INCORRECT": P
RINT AT 2,2;"SCORE": PRINT AT 1,
24;"CORRECT": PRINT AT 2,25;"SCO
RE"
8250 PRINT AT 9,15;"(g4,ig7)": P
RINT AT 10,15;"(g1,g2)"
8255 PLOT 124,104: DRAW 8,0: DRA
W 4,-4: DRAW 0,-8: DRAW -4,-4: D
RAW -8,0: DRAW -4,4: DRAW 0,8: D
RAW 4,4
8260 RANDOMIZE : RANDOMIZE : LET
 min=INT (RND*13)
8265 IF min=12 THEN  GO TO 8260
8267 IF min=0 THEN  LET min=12
8270 RANDOMIZE : RANDOMIZE : LET
 hour=1+INT (RND*12)
8280 LET mins=min*5
8285 IF mins=60 THEN  LET mins=0
8300 LET z=8495
8305 FOR n=1 TO hour
8310 LET z=z+5
8312 IF mins>20 THEN  GO SUB z+1
8315 IF mins<=20 THEN  GO SUB z
8320 GO SUB 9030: PAUSE 5: GO SU
B 9035
8325 NEXT n
8330 GO SUB 9030
8350 LET z=8595
8355 FOR n=1 TO min
8360 LET z=z+5: GO SUB z
8365 GO SUB 9000: PAUSE 5: GO SU
B 9010
8370 NEXT n
8375 GO SUB 9000
8400 PRINT AT 20,7;"WHAT IS THE
TIME ?"
8410 INPUT "HOW MANY MINS PAST T
HE HOUR?";m
8420 INPUT "PAST WHICH HOUR? ";h
8430 IF m=mins AND h=hour THEN
GO SUB 9050
8432 IF m<>mins THEN  GO SUB 910
0: GO TO 8400
8433 IF h<>hour THEN  GO SUB 910
0: GO TO 8400
8440 GO SUB 9035: GO SUB 9010
8442 PRINT AT 21,13;"         "
8445 GO TO 8260
8500 LET x=147: LET y=125: LET a
=-23: LET u=-21: LET q=-11: LET
p=-33: RETURN : REM short 1
8501 LET x=156: LET y=117: LET a
=-32: LET u=-13: LET q=-20: LET
p=-25: RETURN : REM .5 short 1
8505 LET x=160: LET y=112: LET a
=-36: LET u=-8: LET q=-24: LET p
=-20: RETURN : REM short 2
8506 LET x=162: LET y=102: LET a
=-30: LET u=2: LET q=-26: LET p=
-10: RETURN : REM .5 short 2
8510 LET x=163: LET y=96: LET a=
-31: LET u=8: LET q=-31: LET p=-
8: RETURN : REM short 3
8511 LET x=160: LET y=84: LET a=
-24: LET u=16: LET q=-28: LET p=
4: RETURN : REM .5 short 3
8512 IF mins<20 THEN  GO SUB z+1
8515 LET x=157: LET y=77: LET a=
-21: LET u=23: LET q=-33: LET p=
11: RETURN : REM short 4
8516 LET x=152: LET y=70: LET a=
-16: LET u=30: LET q=-28: LET p=
18: RETURN : REM .5 short 4
8520 LET x=146: LET y=66: LET a=
-11: LET u=34: LET q=-22: LET p=
22: RETURN : REM short 5
8521 LET x=136: LET y=62: LET a=
0: LET u=30: LET q=-16: LET p=30
: RETURN : REM .5 short 5
8525 LET x=128: LET y=62: LET a=
8: LET u=30: LET q=-8: LET p=30:
 RETURN : REM short 6
8526 LET x=118: LET y=62: LET a=
18: LET u=30: LET q=2: LET p=30:
 RETURN : REM .5 short 6
8530 LET x=110: LET y=66: LET a=
26: LET u=25: LET q=10: LET p=34
: RETURN : REM short 7
8531 LET x=104: LET y=72: LET a=
28: LET u=16: LET q=16: LET p=28
: RETURN : REM .5 short 7
8535 LET x=96: LET y=78: LET a=3
6: LET u=10: LET q=24: LET p=22:
 RETURN : REM short 8
8536 LET x=93: LET y=88: LET a=3
1: LET u=0: LET q=27: LET p=12:
RETURN : REM .5 short 8
8540 LET x=92: LET y=96: LET a=3
2: LET u=8: LET q=32: LET p=-8:
RETURN : REM short 9
8541 LET x=93: LET y=106: LET a=
26: LET u=-14: LET q=31: LET p=-
2: RETURN : REM .5 short 9
8545 LET x=96: LET y=114: LET a=
34: LET u=-9: LET q=24: LET p=-2
2: RETURN : REM short 10
8546 LET x=104: LET y=120: LET a
=16: LET u=-28: LET q=28: LET p=
-16: RETURN : REM .5 short 10
8550 LET x=109: LET y=125: LET a
=23: LET u=-21: LET q=11: LET p=
-31: RETURN : REM short 11
8551 LET x=120: LET y=128: LET a
=0: LET u=-28: LET q=12: LET p=-
24: RETURN : REM .5 short 11
8555 LET x=128: LET y=131: LET a
=-8: LET u=-31: LET q=8: LET p=-
31: RETURN : REM short 12
8556 LET x=139: LET y=128: LET a
=-19: LET u=-28: LET q=-3: LET p
=-28: RETURN : REM .5 short 12
8600 LET c=160: LET d=152: LET r
=-36: LET t=-52: LET v=-28: LET
b=-60: RETURN : REM long 1
8605 LET c=184: LET d=120: LET r
=-60: LET t=-20: LET v=-52: LET
b=-28: RETURN : REM long 2
8610 LET c=192: LET d=96: LET r=
-56: LET t=4: LET v=-56: LET b=-
4: RETURN : REM long 3
8615 LET c=184: LET d=64: LET r=
-60: LET t=28: LET v=-52: LET b=
36: RETURN : REM long 4
```

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```
8620 LET c=160: LET d=40: LET r=
-36: LET t=52: LET v=-28: LET b=
60: RETURN : REM long 5
8625 LET c=128: LET d=32: LET r=
4: LET t=60: LET v=-4: LET b=60:
 RETURN : REM long 6
8630 LET c=96: LET d=40: LET r=3
6: LET t=52: LET v=28: LET b=60:
 RETURN : REM long 7
8635 LET c=72: LET d=64: LET r=6
0: LET t=28: LET v=52: LET b=36:
 RETURN : REM long 8
8640 LET c=64: LET d=96: LET r=5
6: LET t=-4: LET v=56: LET b=4:
RETURN : REM long 9
8645 LET c=80: LET d=120: LET r=
44: LET t=-28: LET v=52: LET b=-
20: RETURN : REM long 10
8650 LET c=96: LET d=144: LET r=
28: LET t=-52: LET v=36: LET b=-
45: RETURN : REM long 11
```




```
8655 LET c=128: LET d=160: LET r
=-4: LET t=-60: LET v=4: LET b=-
60: RETURN : REM long 12
9000 PLOT c,d: DRAW  OVER 1;r,t:
 PLOT c,d: DRAW  OVER 1;v,b: RET
URN
9010 PLOT c,d: DRAW  OVER 1;r,t:
 PLOT  OVER 1;c,d: DRAW  OVER 1;
v,b: RETURN
9030 PLOT x,y: DRAW  OVER 1;a,u:
 PLOT x,y: DRAW  OVER 1;q,p: RET
URN
9035 PLOT x,y: DRAW  OVER 1;a,u:
 PLOT  OVER 1;x,y: DRAW  OVER 1;
q,p: RETURN
9050 PRINT AT 21,13; FLASH 1;"CO
RRECT": LET score=score+1: PRINT
 AT 3,26;score: BEEP .1,.3: PAUS
E 50: RETURN
9100 PRINT AT 21,13; FLASH 1;" W
RONG ": LET sc=sc+1: PRINT AT 3,
3;sc: BEEP .3,.3: PAUSE 50: RETU
RN
```

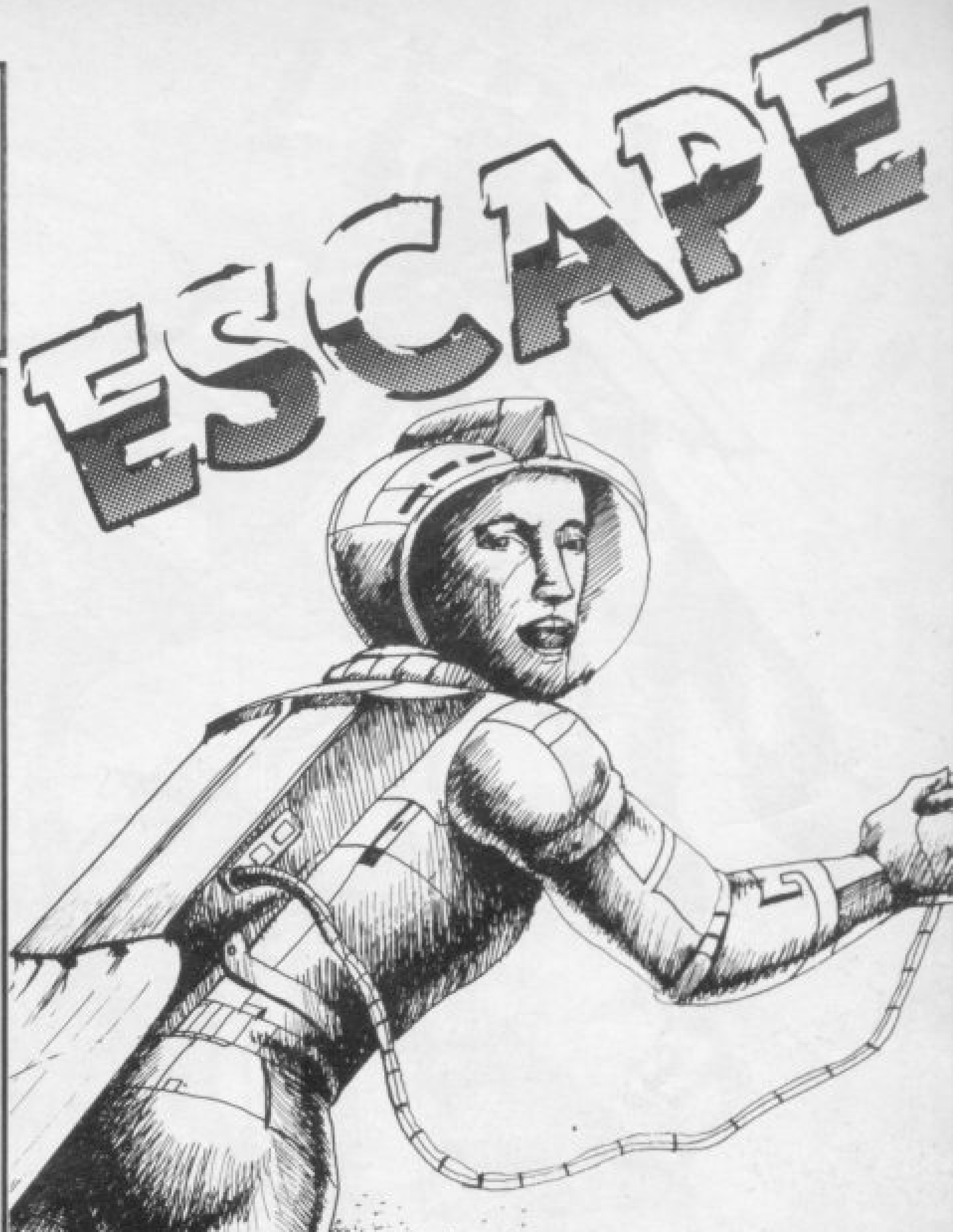
STRETCH

RICHARD GREENWELL of Normanby, near Middlesborough, has written a useful little program to provide some fancy lettering on the Spectrum. **Stretch,** for the 16K Spectrum, will print messages on the screen in 3D perspective, stretching the letters more and more as the message continues. The program will also work with user-defined graphics, and thus could be used to create quite elaborate title screens.

```
   1 REM ********************
***
   2 REM prints ASCII characters

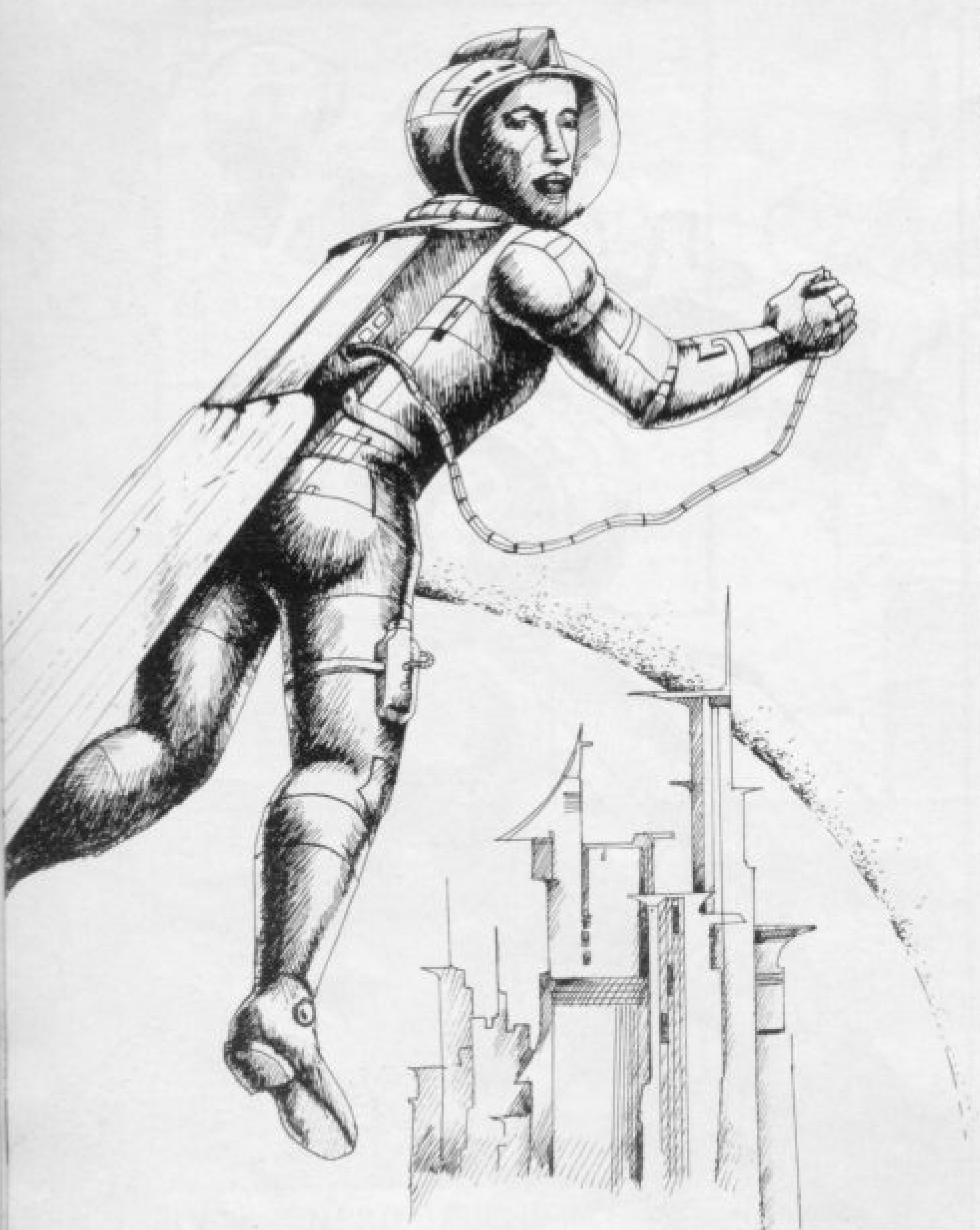
   3 REM at length specified by
     variable si (1 TO 24)
   4 REM  at coordinates.......
(variable x (0 TO 31)
(variable y (0 TO 23)
   5 REM l$ contains character
to  be printed
   6  REM error if si+y >24 or
 non  ASCII character used and
 usual  printing errors
   7 REM ***********************
   9 CLS
  10 INPUT "Please type in your
characters";k$
  20 FOR o=1 TO LEN k$
  30 LET si=o
  40 LET x=o-1
  50 LET y=0
  60 LET l$=k$(o)
  65 GO SUB 140
  70 NEXT o
  80 STOP
 140 IF x>31 OR x<0 OR y<0 OR si
+y>24 OR si<1 OR l$>" OR l$<"
" THEN  PRINT AT 0,32
 150 LET cs=(PEEK 23606)+((PEEK
23607)*256)
 160 LET c=CODE l$
 170 LET cp=cs+(c*8)
 180 GO SUB 300
 190 LET co=0
 200 FOR s=1 TO si
 210 FOR n=0 TO 7
 220 LET pos=16384+((y-f)*32)+y1
+x+(n*256)
 230 IF co=si THEN  LET cp=cp+1:
 LET co=0
 240 LET co=co+1
 250 POKE pos,PEEK cp
 260 NEXT n
 270 LET y=y+1
 280 IF y=8 OR y=16 THEN  GO SUB
 300
 290 NEXT s
 295 RETURN
 300 LET y1=INT (y/8)
 310 LET f=y1*8
 330 LET y1=y1*2048
 340 RETURN
```

IN ESCAPE, for the ZX-81 16K, you have been wrongly convicted and imprisoned on an intergalactic prison planet. In order to escape, you must first dodge the guard to steal a fuel container to power your space pack. Then you must blast off with your spacepack through the outer zone which is patrolled by two spaceships. The game is controlled by using the cursor keys. **Escape** was written by Jonathan Moakes of Ambleside, Cumbria.




```
   1 REM "ESCAPE"
   2 PRINT AT 10,0;"SKILL LEVEL-
ENTER A NUMBER FROM
 1-10"
   3 INPUT R
   4 IF R<1 OR R>10 THEN GOTO 2
   5 LET E=(R/10)
   6 CLS
   8 LET A$="▒ ▒ ▒ ▒ ▒ ▒ ▒ ▒ ▒ ▒ ▒ ▒
▒ ▒ ▒ ▒ ▒ ▒ "
  10 LET B$=" ▒ ▒ ▒ ▒ ▒ ▒ ▒ ▒ ▒ ▒ ▒
▒ ▒ ▒ ▒ ▒ ▒ ▒"
  11 FOR F=1 TO 30
  12 PRINT AT 0,0;A$;AT 21,0;B$
  13 PRINT AT 3,10;"E S C A P E"
;AT 4,9;"-------------"
  14 PRINT AT 10,5;"BY JONATHAN
MOAKES 1984"
  15 PRINT AT 12,3;"""M""....YO
U";AT 14,3;"""■""....GUARD";AT
16,3;"""▓""....FUEL CONTAINER"
  21 PRINT AT 0,0;B$;AT 21,0;A$
  22 NEXT F
  23 LET A=10
  24 LET A$="M"
  25 LET B=8
  26 LET B$="■"
  27 LET C=4
  28 LET X=20
  29 LET D=26
  30 LET Y=30
  32 LET P=0
  34 LET C$="▓"
  35 CLS
  36 PRINT AT 21,0;"▬▬▬▬▬▒▒▒▒▒▒▒▒▒▒▒▒
▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
  42 FOR F=1 TO 21
  43 FAST
  44 PRINT AT F,4;"▌"
  46 NEXT F
  47 PRINT AT 2,10;C$
  48 FOR F=1 TO 18
  50 PRINT AT 20-F,5;F
  52 NEXT F
  53 SLOW
  54 PRINT AT 0,0;"FUEL"
  55 FOR T=65 TO 1 STEP -1
  56 PRINT AT X,Y;" "
  57 PRINT AT 0,15;"TIME:";T;" "
  58 PRINT AT A,B;" "
  62 LET X=X+(INKEY$="6" AND X<2
0)-(INKEY$="7" AND X>1)
  64 LET Y=Y+(INKEY$="8" AND Y<3
1)-(INKEY$="5" AND Y>7)
  66 IF X=2 AND Y=10 THEN GOTO 1
000
  68 IF INT A=X AND INT B=Y THEN
 GOTO 2000
  70 LET A=A+(E AND X>A AND A<20
)-(E AND X<A AND A>1)
  72 LET B=B+(0.8 AND Y>B AND B<
31)-(0.8 AND Y<B AND B>5)
  73 PRINT AT X,Y;A$;AT A,B;B$
  78 NEXT T
  80 CLS
  84 FOR L=1 TO 21
  86 PRINT "▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
▒▒▒▒▒▒▒▒▒▒"
  88 NEXT L
  90 PRINT AT 10,1;"YOU RAN OUT
OF TIME. ";AT 19,1;"BETTER LUCK
NEXT TIME."
 100 STOP
1000 FOR W=1 TO 18
1002 LET P=P+1
1004 FOR L=20-P TO 20
1006 PRINT AT L,1;"▒"
1008 NEXT L
1010 NEXT W
1012 FOR G=0 TO 20
1014 PRINT AT G,7;"
          "
1016 NEXT G
1020 PRINT AT 1,8;"YOU QUICKLY F
ILL THE ";AT 3,8;"FUEL TANK ON Y
OUR SPACE ";AT 5,8;"PACK AND BLA
ST AWAY FROM";AT 7,8;"THE GUARD
TOWARDS THE ";AT 9,8;"OUTER ZONE
 ENTRANCE."
1022 PAUSE 500
```

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```
1024 FOR L=1 TO 20
1026 PRINT AT L,7;"
"
1028 NEXT L
1030 GOTO 2500
2000 CLS
2008 FOR F=1 TO 21
2012 PRINT "▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
▒▒▒▒▒▒"
2014 NEXT F
2020 PRINT AT 10,1;"YOU WERE CAU
GHT BY THE PRISON";AT 11,10;"GUA
RD"
2022 PRINT AT 19,1;"BETTER LUCK
NEXT TIME"
2024 PAUSE 4E4
2026 RUN
2500 PRINT AT 8,7;"▄▄▄▄▄▄▄▄▄▄▄▄▄
▄▄▄▄▄▄"
2502 LET A$="▣"
2504 LET B$=" >"
2506 LET C$="< "
2507 LET X=9
2508 LET A=7
2509 LET Y=20
2510 LET B=13
2512 LET C=5
2514 LET D=24
2516 FOR W=0 TO 18
2518 PRINT AT X,Y;" ";AT A,B;"  "
;AT C,D;"  "
2520 LET X=X+(INKEY$="6" AND X<2
0)-(INKEY$="7")
2522 LET Y=Y+(INKEY$="8" AND Y<3
0)-(INKEY$="5" AND Y>6)
2524 LET B=B+1
2526 IF B=22 THEN LET B=15
2528 LET D=D-1
2530 IF D=15 THEN LET D=23
2532 IF X=A AND Y=B OR X=C AND Y
=D THEN GOTO 6000
```

```
2534 IF X<4 THEN GOTO 5000
2536 IF X=8 AND Y>23 OR X=8 AND
Y<19 THEN GOTO 4000
2537 PRINT AT X,Y;A$;AT A,B;B$;A
T C,D;C$
2538 GOSUB 2600
2540 NEXT W
2600 PRINT AT 20-P,1;" "
2602 LET P=P-1
2604 IF P=0 THEN GOTO 9000
2606 RETURN
4000 CLS
4002 PRINT "WHO FLEW INTO THE BA
RRIER THEN ?"
4004 PAUSE 4E4
4006 RUN
5000 CLS
5001 PRINT "CONGRATULATIONS-YOU
HAVE ESCAPED     FROM THE INTERPL
ANETARY          PRISON PLANET"
5002 PRINT AT 20,0;"PRESS ANY KE
Y FOR ANOTHER GO..."
5003 PAUSE 4E4
5004 CLS
5006 RUN
6000 CLS
6001 PRINT "VERY GOOD - NOW TRY
IT WITH YOUR EYES OPEN..."
6003 PAUSE 4E4
6004 RUN
9000 CLS
9002 PRINT "IF YOU HAD BEEN THIN
KING YOU     MIGHT HAVE SEEN THE
FUEL LEVEL   DROPPING"
9004 PRINT
9006 PRINT "NEVER MIND-TRY AGAIN
"
9008 PAUSE 4E4
9010 RUN
9500 SAVE "ESCAP▣"
9510 RUN
```



PYRAMID



PYRAMID for the 48K Spectrum is based on the successful Q-Bert game where you have to paint in the blocks of the pyramid while avoiding the creatures which chase you. Our version by David Bradley of Manchester starts at a relaxed pace, but by the time you reach the highest levels you will have to contend with the vicious snake and learn how to use the lifts.

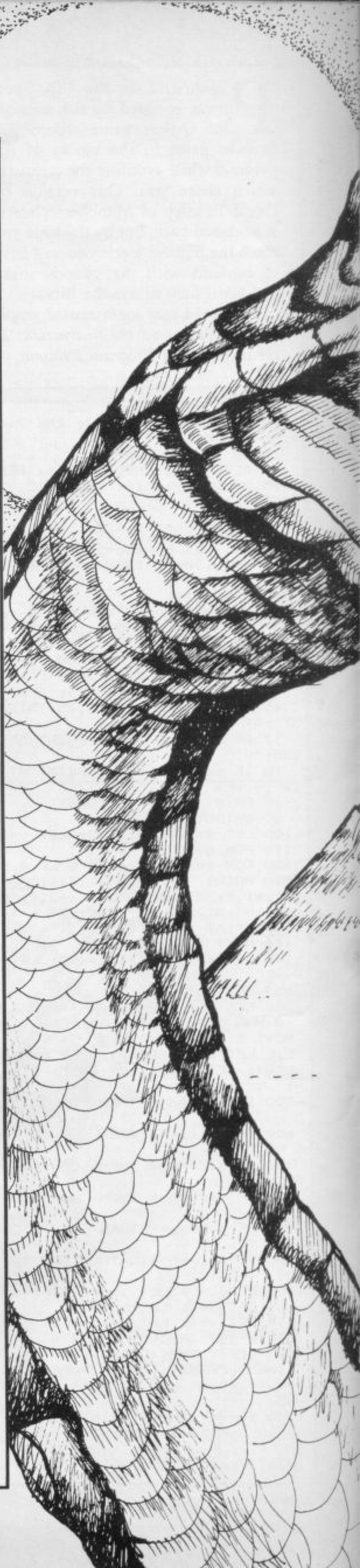
Pyramid *uses sophisticated graphics, so please read the instructions at the beginning of Program Printout.*

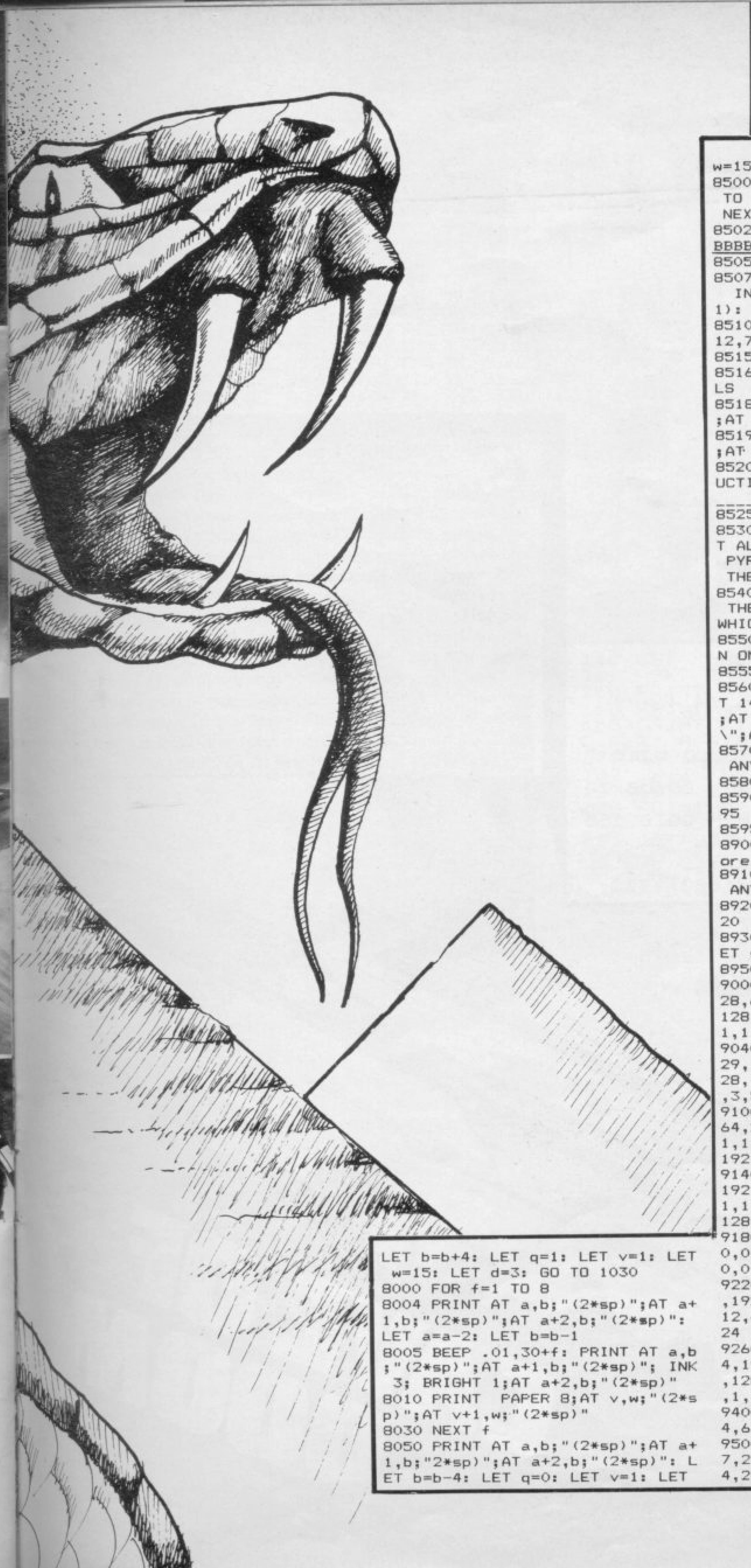
```
   1 BORDER 0: PAPER 0: INK 7: B
RIGHT 1: CLS
   2 GO TO 8500
   4 BEEP .3,7: BEEP .15,4: BEEP
 .15,2: BEEP .15,0: BEEP .15,-3:
 BEEP .45,-4
   5 RETURN
   6 LET hi=0: LET lives=3: LET
score=0: LET screen=1
   7 IF lives=0 THEN  GO SUB 890
0
   9 RANDOMIZE
  10 RESTORE 9000: FOR f=USR "a"
 TO USR "h"+7: READ a: POKE f,a:
 NEXT f
  12 PRINT  INK 2;"SCREEN ";
  13 PRINT  INK 5;screen;
  14 PRINT  INK 3;TAB 25;"SCORE"
  15 PRINT  INK 6;AT 3,25;"HIGHE
ST";AT 4,25; INK 4;hi
  17 IF score=0 THEN  PRINT AT 1
,25;"0"
  18 IF score>0 THEN  PRINT AT 1
,25;score
  19 PRINT  INK 3;"LIVES"
  20 BRIGHT 0
 100 LET z=16: LET x=0: LET y=0
 110 FOR g=1 TO 5
 120 FOR f=6+x TO 22-y STEP 4
 130 PRINT  INK 6;AT z,f+1;"AB";
AT z+1,f;"A(2*SP)B";AT z+2,f;"G(
2*SP)H";AT z+3,f;"CBAD";AT z+4,f
;"BDCA";AT z+5,f+1;"EF"
 140 NEXT f
 145 LET z=z-4: LET x=x+2: LET y
=y+2
 150 NEXT g
 200 RESTORE 9100: FOR f=USR "a"
 TO USR "t"+7: READ a: POKE f,a:
 NEXT f
 210 LET a$="ABABAB": LET b$="CD
CDCD": LET a=17: LET b=15: LET q
=1
 500 IF screen<6 THEN  GO TO 100
0
 600 IF screen=6 THEN  GO TO 200
0
 700 IF screen=7 THEN  GO TO 100
0
 800 IF screen=8 THEN  GO TO 300
0
 850 IF screen=9 THEN  GO TO 200
0
 900 IF screen>=10 THEN  GO TO 5
000
1000 LET d=0: LET j=0: LET i=scr
een: LET g=0: LET h=0
1010 LET v=1: LET w=15: LET p=0:
 LET e=INT (RND*2)
1020 LET t=INT (RND*4): IF t+i>=
4 THEN  PRINT  INK 5; PAPER 8;AT
 v,w;"IJ";AT v+1,w;"KL": GO TO 1
085
1030 IF q=1 THEN  PRINT  INK 7;
PAPER 1;AT a,b;"AB";AT a+1,b;"CD
"
1035 IF q=0 THEN  PRINT  INK 7;
PAPER 1;AT a,b;"EF";AT a+1,b;"GH
"
1037 IF ATTR (a-1,b)=6 THEN  PRI
NT  INK 1; PAPER 0;AT a-1,b;"TS"
;AT a,b-1;"T";AT a,b+2;"S";AT a+
1,b-1;"R";AT a+1,b+2;"Q";AT a+2,
b;"RQ": LET score=score+25: LET
j=j+1: PRINT AT 1,25;score
1040 LET d$=INKEY$
1041 LET d=d-1
1045 IF ATTR (a+2,b-3)=67 AND d$
=CHR$ 122 THEN  PRINT  PAPER 1;A
T a,b;"(2*sp)";AT a+1,b;"(2*sp)"
: LET b=b-4: PRINT  INK 7;AT a,b
;"AB";AT a+1,b;"CD": GO TO 7000
1046 IF ATTR (a+2,b+4)=67 AND d$
=CHR$ 32 THEN  PRINT  PAPER 1;AT
 a,b;"(2*sp)";AT a+1,b;"(2*sp)":
 LET b=b+4: PRINT  INK 7;AT a,b;
"EF";AT a+1,b;"GH": GO TO 8000
1050 IF ATTR (a+3,b)=6 THEN  BEE
P .01,(RND*20)-10
1055 IF ATTR (a+3,b)<>6 THEN  CL
S : GO SUB 4: LET lives=lives-1:
 GO TO 7
1056 IF screen>=10 AND a=g AND b
=h THEN  GO SUB 4: CLS : LET liv
es=lives-1: GO TO 7
1057 IF screen<=8 AND t+i>=4 AND
 a=v AND b=w THEN  GO SUB 4: CLS
 : LET lives=lives-1: GO TO 7
1058 IF screen>=9 AND d<=0 AND a
=v AND b=w THEN  GO SUB 4: CLS :
 LET lives=lives-1: GO TO 7
1059 IF j=15 THEN  RESTORE 9400:
 FOR f=1 TO 19: READ a: BEEP .07
,a: NEXT f: CLS : LET screen=scr
een+1: LET score=score+i*25: GO
TO 7
1060 PRINT  BRIGHT 1; INK 6;AT 3
,0;a$( TO lives*2);AT 4,0;b$( TO
 lives*2)
1070 IF d$=CHR$ 113 THEN  PRINT
 PAPER 1;AT a,b;"(2*sp)";AT a+1,
b;"(2*sp)": BEEP .01,30: LET a=a
-4: LET b=b-2: LET q=0
1072 IF d$=CHR$ 112 THEN  PRINT
 PAPER 1;AT a,b;"(2*sp)";AT a+1,
b;"(2*sp)": BEEP .01,30: LET a=a
-4: LET b=b+2: LET q=1
1074 IF d$=CHR$ 122 THEN  PRINT
 PAPER 1;AT a,b;"(2*sp)";AT a+1,
b;"(2*sp)": BEEP .01,30: LET a=a
+4: LET b=b-2: LET q=0
1075 IF d$=CHR$ 32 THEN  PRINT
PAPER 1;AT a,b;"(2*sp)";AT a+1,b
;"(2*sp)": BEEP .01,30: LET a=a+
4: LET b=b+2: LET q=1
1076 IF d$=CHR$ 122 AND ATTR (a+
4,b+2)=0 OR ATTR (a+4,b+2)=0 THE
N  GO SUB 4: CLS : LET lives=liv
es-1: GO TO 7
1077 IF screen=6 THEN  GO TO 201
0
1078 IF screen=8 THEN  GO TO 301
0
1079 IF screen=9 THEN  GO TO 201
0
1080 IF screen>=10 AND y=0 THEN
 GO TO 5002
1081 IF screen>=10 AND y=1 THEN
 GO TO 5020
1083 IF t+i>=4 THEN  GO TO 1085
1084 GO TO 1010
1086 IF e=0 THEN  LET p=p+2
1087 IF e=1 THEN  LET p=p-2
1090 PRINT  PAPER 8;AT v,w;"(2*s
p)";AT v+1,w;"(2*sp)"
1095 LET v=v+4: LET w=w+p
1100 LET p=0
1105 IF screen=5 THEN  LET e=INT
 (RND*2)
1110 IF v>17 THEN  GO TO 1010
```

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```
1120 PRINT  INK 5; PAPER 8;AT v,
w;"IJ";AT v+1,w;"KL"
1150 GO TO 1030
2000 LET g=0: LET h=0: LET d=0:
LET j=0: LET i=screen: LET e=0:
LET v=1: LET w=15: LET t=0
2001 IF screen>=9 THEN  PRINT  I
NK 3; BRIGHT 1;AT 19,3;"KL";AT 1
9,27;"KL"
2002 LET p=INT (RND*2)
2004 IF p=1 THEN  LET t=+2
2005 IF p=0 THEN  LET t=-2
2010 IF d<=0 THEN  PRINT  INK 4;
 PAPER 8;AT v,w;"MN";AT v+1,w;"O
P"
2020 IF q=1 THEN  PRINT  INK 7;
PAPER 1;AT a,b;"AB";AT a+1,b;"C
 "
2030 IF q=0 THEN  PRINT  INK 7;
PAPER 1;AT a,b;"EF";AT a+1,b;"GH
"
2050 IF ATTR (a-1,b)=6 THEN  PRI
NT  INK 1; PAPER 0;AT a-1,b;"TS"
;AT a,b-1;"T";AT a,b+2;"S";AT a+
1,b-1;"R";AT a+1,b+2;"Q";AT a+2,
b;"RQ": LET score=score+25: LET
j=j+1: PRINT AT 1,25;score
2060 LET e=e+(INT (RND*5)+i/4)
2061 IF screen>=9 AND d<=0 THEN
 LET e=e+(INT (RND*5)+i/3)
2062 IF e>=10 AND v<a AND w<b TH
EN  PRINT  PAPER 8;AT v,w;"  ";A
T v+1,w;"(2*sp)": LET v=v+4: LET
 w=w+2: LET e=0
2064 IF e>=10 AND v>a AND w>b TH
EN  PRINT  PAPER 8;AT v,w;"(2*sp
)";AT v+1,w;"(2*sp)": LET v=v-4:
 LET w=w-2: LET e=0
2066 IF e>=10 AND v>a AND w<b TH
EN  PRINT  PAPER 8;AT v,w;"(2*sp
)";AT v+1,w;"(2*sp)": LET v=v-4:
 LET w=w+2: LET e=0
2068 IF e>=10 AND v<a AND w>b TH
EN  PRINT  PAPER 8;AT v,w;"(2*sp
)";AT v+1,w;"(2*sp)": LET v=v+4:
 LET w=w-2: LET e=0
2070 IF e>=10 AND v=a AND w>b TH
EN  PRINT  PAPER 8;AT v,w;"(2*sp
)";AT v+1,w;"(2*sp)": LET v=v+0:
 LET w=w-4: LET e=0
2072 IF e>=10 AND v=a AND w<b TH
EN  PRINT  PAPER 8;AT v,w;"(2*sp
)";AT v+1,w;"(2*sp)": LET v=v+0:
 LET w=w+4: LET e=0
2074 IF e>=10 AND v<a AND w=b TH
EN PRINT  PAPER 8;AT v,w;"(2*sp
)";AT v+1,w;"(2*sp)": LET v=v+4:
 LET w=w+t: LET e=0
2076 IF e>=10 AND v>a AND w=b TH
EN  PRINT  PAPER 8;AT v,w;"POINT
 2*SP)";AT v+1,w;"(2*sp)": LET v
=v-4: LET w=w+t: LET e=0
2080 GO TO 1040
3000 LET j=0: LET i=screen: LET
v=1: LET w=15: LET t=0
3010 PRINT  INK 5; PAPER 8;AT v,
w;"IJ";AT v+1,w;"KL"
3020 IF q=1 THEN  PRINT  INK 7;
PAPER 1;AT a,b;"AB";AT a+1,b;"C
 "
3030 IF q=0 THEN  PRINT  INK 7;
PAPER 1;AT a,b;"EF";AT a+1,b;"GH
"
3050 IF ATTR (a-1,b)=6 THEN  PRI
NT  INK 1; PAPER 0;AT a-1,b;"TS"
;AT a,b-1;"T";AT a,b+2;"S";AT a+
1,b-1;"R";AT a+1,b+2;"Q";AT a+2,
b;"RQ": LET score=score+25: LET
j=j+1: PRINT AT 1,25;score
3060 LET e=INT (RND*6)+1
3062 IF e=1 AND v>=5 AND ATTR (v
-4,w-3)=6 OR e=1 AND v>=5 AND AT
TR (v-4,w-3)=1 THEN  PRINT  PAPE
R 8;AT v,w;"(2*SP)";AT v+1,w;"(2
*SP)": LET v=v-4: LET w=w-2
3064 IF e=2 AND v>=5 AND ATTR (v
-4,w+3)=6 OR e=2 AND v>=5 AND AT
TR (v-4,w+3)=1 THEN  PRINT  PAPE
R 8;AT v,w;"(2*sp)";AT v+1,w;"(2
*sp)": LET v=v-4: LET w=w+2
3066 IF e=3 AND v<=13 AND ATTR (
v+4,w-3)=6 OR e=3 AND v<=13 AND
ATTR (v+4,w-3)=1 THEN  PRINT  PA
PER 8;AT v,w;"(2*sp)";AT v+1,w;"
(2*sp)": LET v=v+4: LET w=w-2
3068 IF e=4 AND ATTR (v+4,w+3)=6
 OR e=4 AND ATTR (v+4,w+3)=1 THE
N  PRINT  PAPER 8;AT v,w;"(2*sp)
";AT v+1,w;"(2*sp)": LET v=v+4:
LET w=w+2
3070 IF e=5 AND ATTR (v,w-2)=6 O
R e=5 AND ATTR (v,w-2)=1 THEN  P
RINT  PAPER 8;AT v,w;"(2*sp)";AT
 v+1,w;"(2*sp)": LET v=v+0: LET
w=w-4
3072 IF e=6 AND ATTR (v,w+3)=6 O
R e=6 AND ATTR (v,w+3)=1 THEN  P
RINT  PAPER 8;AT v,w;"(2*sp)";AT
 v+1,w;"(2*sp)": LET v=v+0: LET
w=w+4
3080 GO TO 1040
5000 LET d=0: LET j=0: LET i=scr
een: LET e=0: LET v=1: LET w=15:
 LET t=0: LET y=0
5001 PRINT  INK 3; BRIGHT 1;AT 1
9,3;"KL";AT 19,27;"KL"
5002 LET s=INT (RND*4)
5003 IF s=0 THEN  LET g=5: LET h
=29
5004 IF s=1 THEN  LET g=9: LET h
=27
5005 IF s=2 THEN  LET g=13: LET
h=29
5006 IF s=3 THEN  LET g=17: LET
h=27
5007 PRINT  INK 5; PAPER 8;AT g,
h;"IJ";AT g+1,h;"KL": LET y=1
5010 LET p=INT (RND*2)
5012 IF p=1 THEN  LET t=+2
5014 IF p=0 THEN  LET t=-2
5020 IF h>=6 THEN  PRINT  PAPER
8;AT g,h;"(2*sp)";AT g+1,h;"(2*s
p)": LET h=h-4
5022 IF h>=6 THEN  PRINT  INK 5;
 PAPER 8;AT g,h;"IJ";AT g+1,h;"K
L"
5024 IF h<6 THEN  PRINT AT g,h;"
(2*sp)";AT g+1,h;"(2*sp)": LET y
=0
5025 IF d<=0 THEN  PRINT  INK 4;
 PAPER 8;AT v,w;"MN";AT v+1,w;"O
P"
5030 IF q=1 THEN  PRINT  INK 7;
PAPER 1;AT a,b;"AB";AT a+1,b;"CD
"
5040 IF q=0 THEN  PRINT  INK 7;
PAPER 1;AT a,b;"EF";AT a+1,b;"GH
"
5050 IF ATTR (a-1,b)=6 THEN  PRI
NT  INK 1; PAPER 0;AT a-1,b;"TS"
;AT a,b-1;"T";AT a,b+2;"S";AT a+
1,b-1;"R";AT a+1,b+2;"Q";AT a+2,
b;"RQ": LET score=score+25: LET
j=j+1: PRINT AT 1,25;score
5060 GO TO 2060
7000 FOR f=1 TO 8
7004 PRINT AT a,b;"(2*sp)";AT a+
1,b;"(2*sp)";AT a+2,b;"(2*sp)":
LET vic=1: LET a=a-2: LET b=b+1
7005 BEEP .01,30+f: PRINT AT a,b
;"AB";AT a+1,b;"C ";  INK 3; BRI
GHT 1;AT a+2,b;"KL"
7010 PRINT  PAPER 8;AT v,w;"(2*s
p)";AT v+1,w;"(2*sp)"
7030 NEXT f
7040 PRINT AT a,b;"(2*sp)";AT a+
1,b;"(2*sp)";AT a+2,b;"(2*sp)":
```





```
LET b=b+4: LET q=1: LET v=1: LET
 w=15: LET d=3: GO TO 1030
8000 FOR f=1 TO 8
8004 PRINT AT a,b;"(2*sp)";AT a+
1,b;"(2*sp)";AT a+2,b;"(2*sp)":
LET a=a-2: LET b=b-1
8005 BEEP .01,30+f: PRINT AT a,b
;"(2*sp)";AT a+1,b;"(2*sp)"; INK
 3; BRIGHT 1;AT a+2,b;"(2*sp)"
8010 PRINT  PAPER 8;AT v,w;"(2*s
p)";AT v+1,w;"(2*sp)"
8030 NEXT f
8050 PRINT AT a,b;"(2*sp)";AT a+
1,b;"2*sp)";AT a+2,b;"(2*sp)": L
ET b=b-4: LET q=0: LET v=1: LET
w=15: LET d=3: GO TO 1030
8500 RESTORE 9500: FOR f=USR "a"
 TO USR "c"+7: READ a: POKE f,a:
 NEXT f
8502 LET a$="ABBBBBBBBBBBBBBBBBB
BBBBBBBBBBBC"
8505 LET a=16: LET b=0
8507 FOR f=1 TO 29 STEP 2: PRINT
  INK 2;AT a,b;a$( TO 30-f);a$(3
1): LET a=a-1: LET b=b+1: NEXT f
8510 PRINT AT 8,12;"PYRAMID";AT
12,7;"by David Bradley"
8515 PAUSE 125
8516 BORDER 0: PAPER 0: INK 7: C
LS
8518 FOR f=0 TO 31: PRINT  INK 2
;AT 0,f;"B";AT 21,f;"B": NEXT f
8519 FOR f=1 TO 20: PRINT  INK 2
;AT f,0;"B";AT f,31;"B": NEXT f
8520 PRINT  INK 7;AT 1,10;"INSTR
UCTIONS"; OVER 1;AT 1,10;"______
______"
8525 INK 6
8530 PRINT AT 3,1;"YOU MUST PAIN
T ALL THE BLOCKS";AT 4,1;"OF THE
 PYRAMID TO PROGRESS";AT 5,1;"TO
 THE NEXT SCREEN"
8540 PRINT AT 7,1;"WATCH OUT FOR
 THE BALLS & THE";AT 8,1;"SNAKE
WHICH WILL KILL YOU"
8550 PRINT AT 10,1;"EACH LIFT CA
N ONLY BE USED";AT 11,1;"ONCE"
8555 INK 4
8560 PRINT AT 13,13;"Q(4*sp)P";A
T 14,14;"\(2*sp)/";AT 15,15;"\/"
;AT 16,15;"/\";AT 17,14;"/(2*sp)
\";AT 18,13;"Z(4*sp)SPACE"
8570 PRINT  INK 3;AT 20,1;"PRESS
 ANY KEY TO PLAY THE GAME"
8580 PAUSE 0
8590 IF INKEY$="" THEN  GO TO 85
95
8595 CLS : INK 7: GO TO 6
8900 IF score>hi THEN  LET hi=sc
ore
8910 PRINT  INK 6;AT 11,1;"PRESS
 ANY KEY TO PLAY THE GAME"
8920 IF INKEY$="" THEN  GO TO 89
20
8930 LET lives=3: LET score=0: L
ET screen=1
8950 CLS : RETURN
9000 DATA 1,2,4,8,16,32,64,128,1
28,64,32,16,8,4,2,1,128,128,128,
128,128,128,128,128,1,1,1,1,1,1,
1,1
9040 DATA 129,65,33,17,9,5,3,1,1
29,130,132,136,144,160,192,128,1
28,192,160,144,136,132,130,129,1
,3,5,9,17,33,65,129
9100 DATA 0,1,3,3,3,1,3,3,0,128,
64,224,192,128,192,64,3,3,1,1,1,
1,1,1,64,64,128,128,128,128,128,
192
9140 DATA 0,1,2,7,3,1,3,2,0,128,
192,192,192,128,192,192,2,2,1,1,
1,1,1,3,192,192,128,128,128,128,
128,128
9180 DATA 0,0,0,0,3,7,15,15,0,0,
0,0,192,224,240,240,15,15,7,3,0,
0,0,0,240,240,224,192,0,0,0,0
9220 DATA 0,3,5,15,7,0,0,0,0,128
,192,224,176,48,96,192,1,3,6,12,
12,6,3,1,152,36,34,6,12,24,176,2
24
9260 DATA 255,254,252,248,240,22
4,192,128,255,127,63,31,15,7,3,1
,128,192,224,240,248,252,254,255
,1,3,7,15,31,63,127,255
9400 DATA 9,9,9,7,7,7,6,6,6,4,4,
4,6,6,6,7,7,9,11
9500 DATA 1,3,7,0,31,63,127,0,24
7,247,247,0,127,127,127,0,192,22
4,240,0,124,126,127,0
```

Listing 1

```
   1 REM .....................
.....................
  10 FOR X=16514 TO 16560
  20 INPUT CODE
  30 POKE X,CODE
  40 PRINT X,CODE
  50 NEXT X
```

Listing 2

42	12	64	229	209	1
24	3	26	190	40	3
238	128	18	19	11	62
0	176	177	32	241	201
42	12	64	35	229	209
35	62	24	1	31	0
237	176	35	35	19	19
61	32	244	201		

Listing 3

```
  10 RAND
  20 LET SCO=0
  30 CLS
  90 POKE 16418,0
 100 LET X=USR 16514
 110 LET SHIP=11
 120 PRINT AT 10,0;"
                               "
 130 PRINT AT 11,0;"
                               "
 140 PRINT AT 12,0;"
                               "
 150 LET CA=10
 151 PRINT AT 11,0;"WOULD LIKE T
HE INSTRUCTIONS(Y/N)"
 152 IF INKEY$="Y" THEN GOSUB 30
00
 153 IF INKEY$="N" THEN GOTO 155
 154 GOTO 151
 155 PRINT AT 11,0;"
                               ▓"
 158 LET WR=INT (RND*1500)+700
 159 FOR T=1 TO WR
 160 LET R=INT (RND*70)+1
 161 IF INKEY$="7" THEN LET SHIP
=SHIP-1
 162 IF INKEY$="6" THEN LET SHIP
=SHIP+1
 165 LET SCO=SCO+20
 170 IF R<21 AND CA>4 THEN LET C
A=CA-1
 175 IF R<41 AND R>20 AND CA<17
THEN LET CA=CA+1
 180 IF R>40 AND R<45 AND CA>4 T
HEN LET CA=CA-2
 185 IF R>45 AND R<51 AND CA<17
THEN LET CA=CA+2
 190 PRINT AT CA,30;" "
 200 PRINT AT CA+1,30;" "
 210 PRINT AT CA+2,30;" "
 215 IF INT (RND*5)=0 THEN PRINT
 AT INT (RND*3)+CA,30;"O"
```

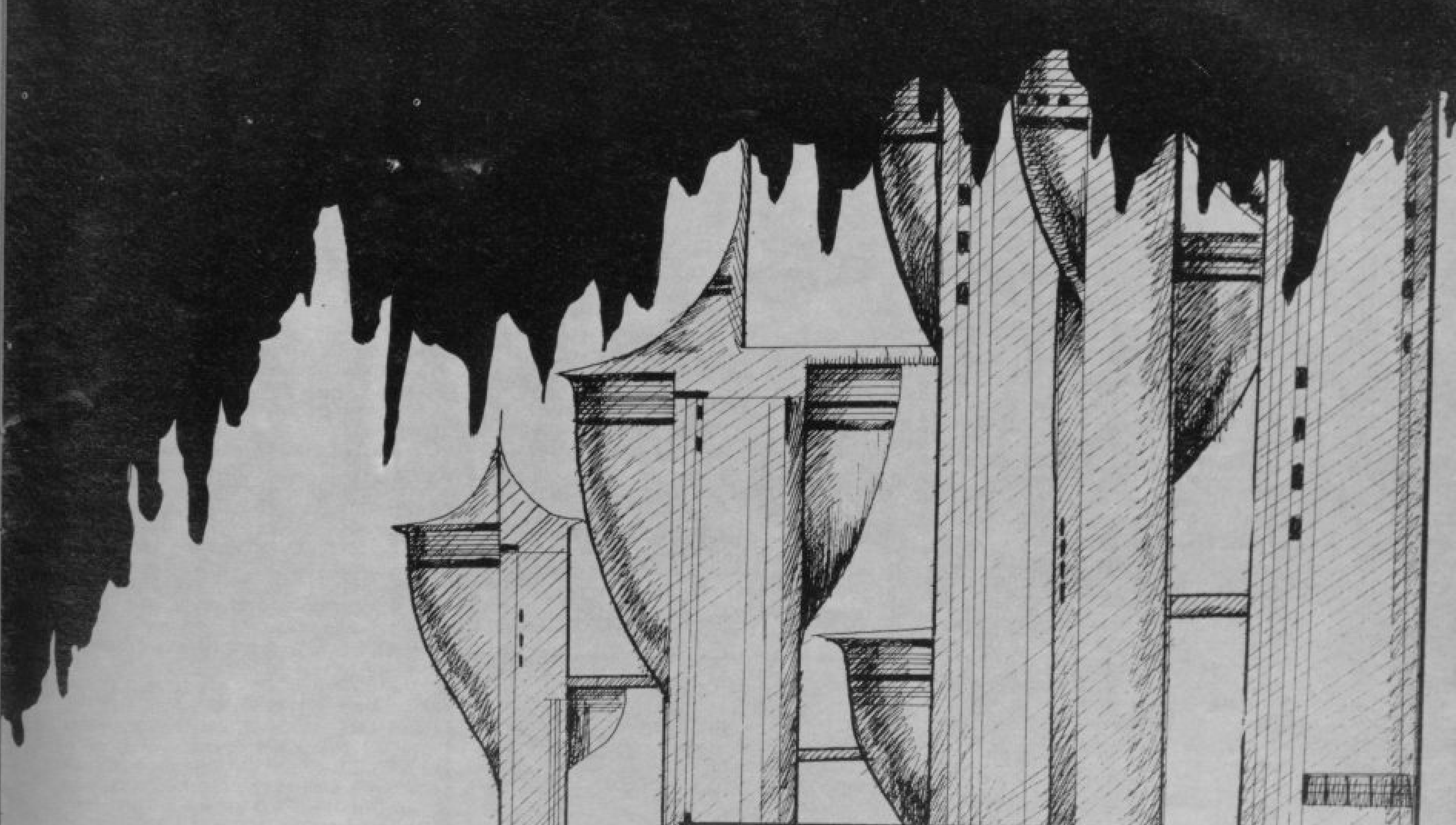
CAVE OF DOOM for the 16K ZX-81 has much in common with the arcade favourite Skramble. You must pilot your spaceship through a cavern, dodging the enemy mines, until you reach your own city. It was written by Stephen Owen of Hatfield, Hertfordshire and uses a machine code routine to speed the action.

You must first enter listing one, making sure there are 46 characters in the REM statement. RUN the program and INPUT the values in listing two, one at a time, reading from left to right. It would be wise to save the program at that stage in case of error.

Then delete lines 10 to 50 from the program leaving you with the REM statement, which should then contain a jumble of characters and control words. Enter listing three, of which the REM statement will form the first line, and RUN in the usual way to play the game.



CAVE OF DOOM



```
 220 LET X=USR 16538
 230 PRINT AT SHIP,0;
 240 LET Q=PEEK (PEEK 16398+256*
PEEK 16399)
 250 IF Q<>0 THEN GOTO 2000
 260 PRINT AT SHIP,0;">"
 270 NEXT T
 275 CLS
 279 FOR G=1 TO 3
 280 FOR F=1 TO 22
 290 PRINT AT F,11;"WELDONE"
 295 LET X=USR 16514
 300 NEXT F
 305 CLS
 310 NEXT G
 320 LET SCO=SCO+2000
 340 GOTO 2150
2000 PRINT AT SHIP-1,0;"▒"
2010 PRINT AT SHIP,0;"▒▒"
2020 PRINT AT SHIP+1,0;"▒"
2040 FOR F=0 TO 6
2050 LET X=USR 16514
2051 NEXT F
2060 PRINT AT SHIP-1,0;"▒"
2070 PRINT AT SHIP+1,0;"▒"
2080 FOR F=0 TO 6
2090 LET X=USR 16514
2091 NEXT F
2100 PRINT AT SHIP-1,0;" "
2110 PRINT AT SHIP,0;"  "
2120 PRINT AT SHIP+1,0;" "
2130 FOR F=0 TO 11
2140 LET X=USR 16514
2141 NEXT F
2150 PRINT AT 10,10;"GAME OVER"
2160 PRINT AT 0,10;"SCORE=";SCO
2165 PRINT AT 23,4;"PRESS A KEY
TO PLAY AGAIN"
2170 IF INKEY$="" THEN GOTO 2170
2180 IF INKEY$<>"" THEN GOTO 20
2190 GOTO 2180
3000 PRINT AT 11,0;"
                 ▒"
3001 LET A$="
                   INTERCAPTED BY A
LARGE ALIEN ATTACK,YOU SEEK COVE
R IN A OLD CAVE WHICH LEADS TO Y
OUR BASE.THERE IS NO TURNING BAC
K NOW,THERE IS ONLY ONE WAY OUT
BUT.....THE CAVE HAS BEEN MINED
BY THE ALIENS ""O"" (ONE TOUCH W
ITH THESE OR THE SIDES OF THE CA
VE MEANS INSTANT DEATH)......YOU
 USE-          ""6""=DOWN     ""7""
=UP
   GOOD LUCK....YOU,LL NEED IT.

*"
3010 LET L=1
3020 IF A$(L+30)="*" THEN RETURN

3030 PRINT AT 11,0;A$(L TO L+30)
3040 LET L=L+1
3041 FOR F=1 TO 1
3042 NEXT F
3050 GOTO 3020
6090 SAVE "CAVE▒"
7000 LET A$="
                              STEP
HEN OWEN PRESENTS
                  CAVE OF DOOM

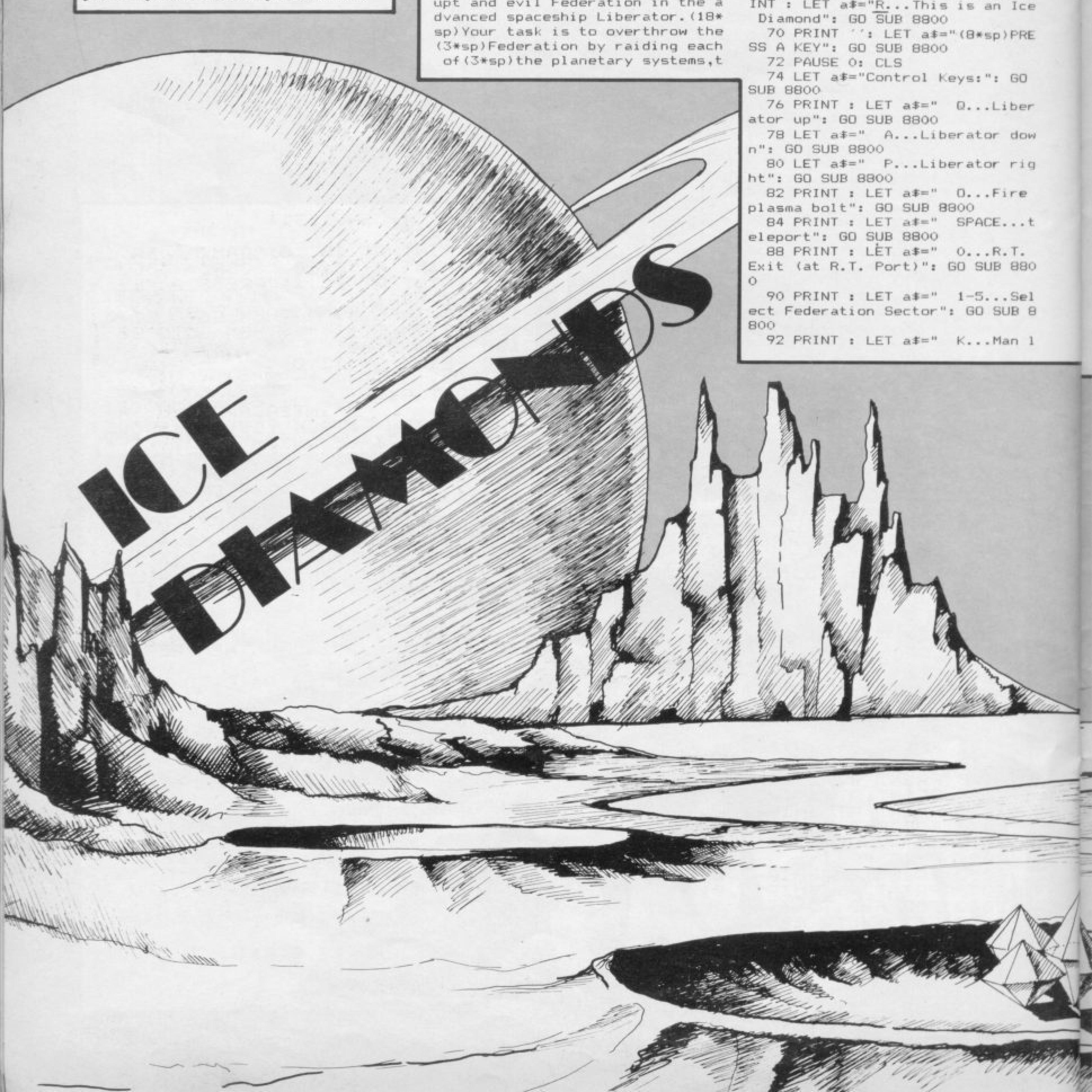

     *"
7010 LET L=1
7020 IF A$(L+31)="*" THEN GOTO 7
100
7025 IF A$(L+8)="▒" THEN PAUSE 2
00
7030 PRINT AT 10,0;A$(L TO L+30)
7060 LET L=L+1
7070 GOTO 7020
7080 RUN
```

ICE DIAMONDS

YOU ARE the captain of the spaceship Liberator and it is your mission to steal the ice diamonds from the evil Federation. The game runs on the 48K Spectrum and was written by Jason Glover of Beaconsfield, Buckinghamshire. Glover clearly is a great science fiction enthusiast, and his game requires quick reactions and an eye on the whole screen. There are five planetary systems to explore and action on the ground, as well as in space.

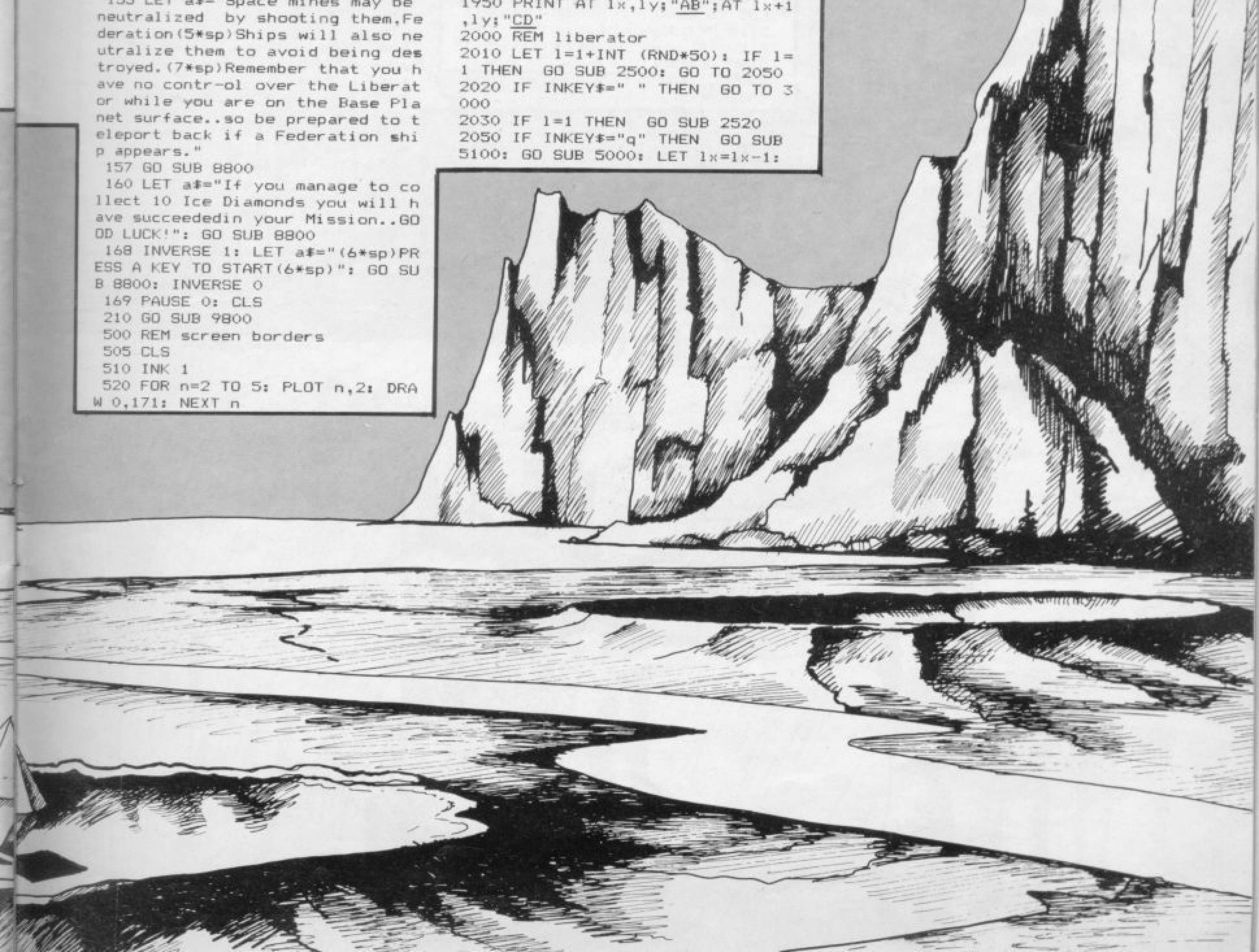
The game uses special graphics characters. Please read the first page of Program printout before typing in the listing, where you will find the necessary instructions.

```
   5 GO SUB 9200
  10 GO SUB 9100
  11 BORDER 0: PAPER 0: INK 7: C
LS
  12 PRINT "Initializing..hang o
n a sec."
  15 GO SUB 9600
  16 BEEP .1,20: CLS : LET a$="D
o you require instructions?": GO
 SUB 8800
  17 IF INKEY$="y" THEN  GO TO 2
0
  18 IF INKEY$="n" THEN  GO TO 2
00
  19 GO TO 17
  25 CLS
  30 INVERSE 1: LET a$="(8*sp)BL
AKE'S SEVEN(10*sp)": GO SUB 8800
: INVERSE 0
  31 PRINT '
  35 GO SUB 8800: PRINT '
  40 LET a$="You are Blake cruis
ing the five sectors of the corr
upt and evil Federation in the a
dvanced spaceship Liberator.(18*
sp)Your task is to overthrow the
(3*sp)Federation by raiding each
 of(3*sp)the planetary systems,t
ravellingat high speed between t
hem...": GO SUB 8800
  52 PRINT ''': LET a$="(9*sp)PR
ESS A KEY": GO SUB 8800
  54 PAUSE 0: CLS
  56 LET a$="AB": GO SUB 8800
  58 LET a$="CD...This is the Li
berator": GO SUB 8800
  60 PRINT '': LET a$="EF...A Fe
deration Pursuit Ship": GO SUB 8
800
  62 PRINT '': LET a$="G...A Spa
ce Mine": GO SUB 8800
  64 PRINT '': LET a$="KK": GO S
UB 8800
  66 LET a$="KK...Real Time Port
 for fast": GO SUB 8800
  68 LET a$="exit from planetary
 system.": GO SUB 8800
  69 PRINT : LET a$="L...This is
 you,Roj Blake        ": GO SUB 88
00: PRINT : LET a$="Q...This is
a surface mine": GO SUB 8800: PR
INT : LET a$="R...This is an Ice
 Diamond": GO SUB 8800
  70 PRINT '': LET a$="(8*sp)PRE
SS A KEY": GO SUB 8800
  72 PAUSE 0: CLS
  74 LET a$="Control Keys:": GO
SUB 8800
  76 PRINT : LET a$="  Q...Liber
ator up": GO SUB 8800
  78 LET a$="  A...Liberator dow
n": GO SUB 8800
  80 LET a$="  P...Liberator rig
ht": GO SUB 8800
  82 PRINT : LET a$="  O...Fire
plasma bolt": GO SUB 8800
  84 PRINT : LET a$="  SPACE...t
eleport": GO SUB 8800
  88 PRINT : LET a$="  O...R.T.
Exit (at R.T. Port)": GO SUB 880
0
  90 PRINT : LET a$="  1-5...Sel
ect Federation Sector": GO SUB 8
800
  92 PRINT : LET a$="  K...Man 1
```



```
eft": GO SUB 8800
  94 LET a$="  L...Man right": G
O SUB 8800
  98 PRINT ': LET a$="(8*sp)PRES
S A KEY": GO SUB 8800
 100 PAUSE 0
 110 CLS : LET a$="When a planos
tationary orbit hasbeen attained
,you may teleport  to the planet
ary surface and tryto take any F
ederation Ice Diam-onds(avoiding
 teleporting onto  a surface min
e)or fly across theSector and en
ter the Real Time  Exit Port to
fly at False Time  to another Se
ctor.": GO SUB 8800
 120 LET a$="Federation Pursuit
Ships will(3*sp)periodically loc
ate you and(5*sp)attack..you mus
t use your PlasmaBolts to destro
y them.": GO SUB 8800
 125 LET a$="When in combat with
 Pursuit(5*sp)Ships,Zen will not
 allow you(4*sp)to teleport sinc
e you are requi-red to defend Li
berator.": GO SUB 8800
 130 PRINT ''': LET a$="(8*sp)PR
ESS A KEY": GO SUB 8800
 132 PAUSE 0
 135 CLS
 150 LET a$="If Liberator hits a
 Space Mine  or is shot by a Fed
eration(6*sp)Pursuit Ship 1 unit
 of damage(3*sp)will occur..Libe
rator can accept5 units before a
nnihilation.(4*sp)If you step or
 teleport on a(4*sp)surface mine
 a life is lost.(4*sp)Your energ
y is depleted wheneveryou fire o
r teleport.": GO SUB 8800
 155 LET a$="Space mines may be
neutralized  by shooting them,Fe
deration(5*sp)Ships will also ne
utralize them to avoid being des
troyed.(7*sp)Remember that you h
ave no contr-ol over the Liberat
or while you are on the Base Pla
net surface..so be prepared to t
eleport back if a Federation shi
p appears."
 157 GO SUB 8800
 160 LET a$="If you manage to co
llect 10 Ice Diamonds you will h
ave succeededin your Mission..GO
OD LUCK!": GO SUB 8800
 168 INVERSE 1: LET a$="(6*sp)PR
ESS A KEY TO START(6*sp)": GO SU
B 8800: INVERSE 0
 169 PAUSE 0: CLS
 210 GO SUB 9800
 500 REM screen borders
 505 CLS
 510 INK 1
 520 FOR n=2 TO 5: PLOT n,2: DRA
W 0,171: NEXT n
 530 FOR n=250 TO 253: PLOT n,2:
DRAW 0,171: NEXT n
 540 FOR n=170 TO 173: PLOT 2,n:
DRAW 251,0: NEXT n
 550 FOR n=2 TO 5: PLOT 2,n: DRA
W 251,0: NEXT n
 560 FOR n=28 TO 31: PLOT 2,n: D
RAW 251,0: NEXT n
 570 FOR n=64 TO 67: PLOT 2,n: D
RAW 251,0: NEXT n
 580 INK 7
 590 LET mov=0
 600 GO SUB 8500: REM system
 620 LET z$=p$(sys)
 630 GO SUB 8400
 640 GO SUB 8300
 700 GO SUB 7400+(sys*100): REM
gen.sys.from 7500
1500 REM initials
1510: LET lx=6: LET ly=1
1520 LET fx=50
1525 IF mov=1 THEN  GO TO 1800
1530 LET dam=0: LET liv=5
1540 LET id=0
1550 LET dia=0
1560 LET en=99
1570 LET dp=0
1600 GO SUB 6430: PRINT AT 20,1;
 INVERSE 1; INK 2;"DAMAGE"
1610 PRINT AT 20,8; INVERSE 1; I
NK 5;"LIVES"
1620 GO SUB 6520
1630 PRINT AT 20,14; INVERSE 1;
INK 6;"DIAMONDS"
1635 GO SUB 6620
1640 PRINT AT 20,23; INVERSE 1;
INK 3;"ENERGY"
1650 GO SUB 6675
1800 PRINT AT 1,29; INK 3;"KK";A
T 2,29; INK 3;"KK"
1950 PRINT AT lx,ly;"AB";AT lx+1
,ly;"CD"
2000 REM liberator
2010 LET l=1+INT (RND*50): IF l=
1 THEN  GO SUB 2500: GO TO 2050
2020 IF INKEY$=" " THEN  GO TO 3
000
2030 IF l=1 THEN  GO SUB 2520
2050 IF INKEY$="q" THEN  GO SUB
5100: GO SUB 5000: LET lx=lx-1:
GO SUB 5120: GO SUB 5000
2060 IF INKEY$="a" THEN  GO SUB
5200: GO SUB 5000: LET lx=lx+1:
GO SUB 5220: GO SUB 5000
2070 IF INKEY$="p" THEN  GO SUB
5300: GO SUB 5000: LET ly=ly+1:
GO SUB 5320: GO SUB 5000
2080 IF INKEY$="o" THEN  GO SUB
5400
2085 IF INKEY$="0" THEN  IF lx=1
 AND ly=29 THEN  GO TO 7350
2490 IF l=1 THEN  GO TO 2030
2495 GO TO 2010
2499 REM federation ship
2500 LET fx=1+INT (RND*12)
2505 LET fy=29
2510 GO SUB 6100
2515 IF fx=lx THEN  IF ly>27 THE
N  GO SUB 6000
2517 IF fx=lx+1 THEN  IF ly>27 T
HEN  GO SUB 6000
2520 GO SUB 6100
2525 LET fr=1+INT (RND*2)
2530 IF fr=1 THEN  IF fx>lx THEN
  LET fx=fx-1
2540 IF fr=1 THEN  IF fx<lx THEN
  LET fx=fx+1
2550 LET fy=fy-1
2600 GO SUB 6100
2610 LET ff=1+INT (RND*5)
2620 IF ff=1 THEN  GO SUB 6200
2900 IF fy=1 THEN  GO SUB 6100:
LET l=0: RETURN
2999 RETURN
3000 REM teleport/surface act.
3010 GO SUB 4900
3020 PRINT AT 16,tp; INK 0; PAPE
R 5;"L"
```

. continued on page 80



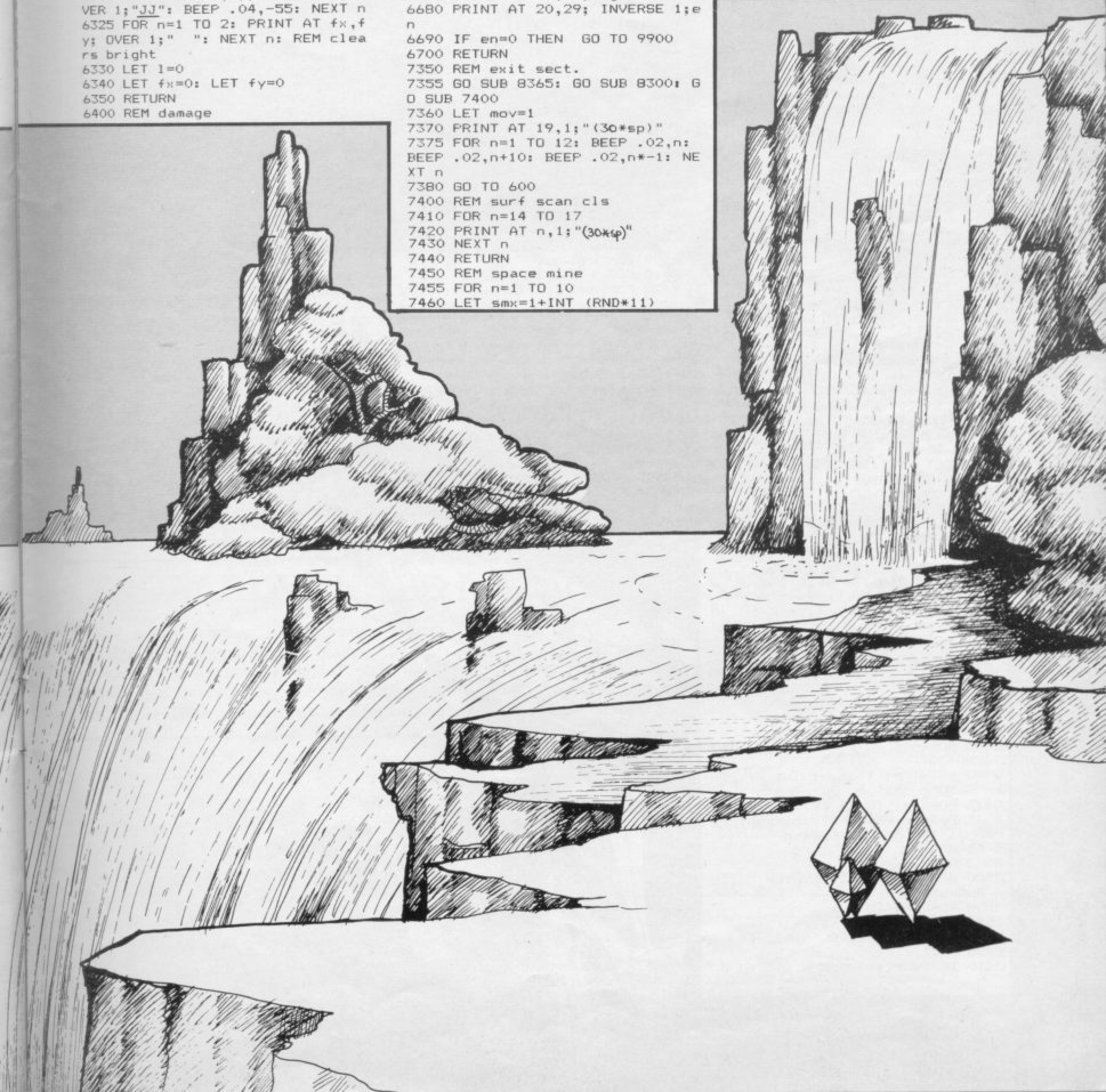
continued from page 79

```
3050 LET l=1+INT (RND*50): IF l=
1 THEN  GO SUB 2500: GO TO 3080
3060 IF INKEY$=" " THEN  GO SUB
4905: PRINT AT 16,tp; PAPER 5;"
": GO TO 2050
3070 IF l=1 THEN  GO SUB 2520
3080 IF INKEY$="k" THEN  GO SUB
4700
3090 IF INKEY$="l" THEN  GO SUB
4760
3190 IF l=1 THEN  GO TO 3060
3200 GO TO 3050
4700 REM man left
4710 IF ATTR (16,tp-1)=43 THEN
PRINT AT 16,tp; PAPER 5;" ": LET
 tp=tp-1: GO TO 4800
4712 IF ATTR (16,tp-1)=46 THEN
LET dp=1
4715 PRINT AT 16,tp; PAPER 5;" "
4720 LET tp=tp-1
4730 IF tp/2=INT (tp/2) THEN  PR
INT AT 16,tp; PAPER 5; INK 0;"N"
4740 IF tp/2<>INT (tp/2) THEN  P
RINT AT 16,tp; PAPER 5; INK 0;"O
"
4745 IF dp=1 THEN  GO SUB 6600
4750 RETURN
4759 REM man right
4760 IF ATTR (16,tp+1)=43 THEN
PRINT AT 16,tp; PAPER 5;" ": LET
 tp=tp+1: GO TO 4800
4763 IF ATTR (16,tp+1)=46 THEN
LET dp=1
4765 PRINT AT 16,tp; PAPER 5;" "
4770 LET tp=tp+1
4775 IF tp/2=INT (tp/2) THEN  PR
INT AT 16,tp; PAPER 5; INK 0;"L"
4780 IF tp/2<>INT (tp/2) THEN  P
RINT AT 16,tp; PAPER 5; INK 0;"M
"
4783 IF dp=1 THEN  GO SUB 6600
4785 RETURN
4800 REM man dead
4805 FOR n=4 TO 1 STEP -1
4810 PRINT AT 16,tp; PAPER 5;"H"
: BEEP .1,n
4820 PRINT AT 16,tp; PAPER 5;"I"
: BEEP .1,n-10
4830 PRINT AT 16,tp; PAPER 5;"J"
: BEEP .1,n-20
4835 NEXT n
4840 PRINT AT 16,tp; PAPER 5;" "
4843 GO SUB 8370
4845 GO SUB 6500
4850 GO TO 2050
4899 REM telep.
4900 LET tp=1+INT (RND*30)
4903 IF ATTR (16,tp)=43 THEN  GO
 TO 4800
4904 IF ATTR (16,tp)=46 THEN  GO
 SUB 6600
4905 FOR x=1 TO 2
4910 FOR n=1 TO 7
4920 PRINT AT 16,tp; PAPER 5; IN
K n;"P"
4930 BEEP .005,n: BEEP .005,n+1
4940 NEXT n
4950 NEXT x
4960 GO SUB 6660
4995 RETURN
4999 REM print liberator
5000 PRINT AT lx,ly; OVER 1;"AB"
;AT lx+1,ly;"CD"
5010 RETURN
5099 REM checks space mine
5100 IF ATTR (lx-1,ly)=4 THEN  G
O TO 6000
5110 IF ATTR (lx-1,ly+1)=4 THEN
 GO TO 6000
5115 RETURN
5120 IF lx=0 THEN  LET lx=1
5195 RETURN
5200 IF ATTR (lx+2,ly)=4 THEN  G
O TO 6000
5210 IF ATTR (lx+2,ly+1)=4 THEN
 GO TO 6000
5215 RETURN
5220 IF lx=12 THEN  LET lx=11
5295 RETURN
5300 IF ATTR (lx,ly+2)=4 THEN  G
O TO 6000
5310 IF ATTR (lx+1,ly+2)=4 THEN
 GO TO 6000
5315 RETURN
5320 IF ly=30 THEN  LET ly=ly-1
5395 RETURN
5399 REM fire!
5400 IF ly>25 THEN  RETURN
5405 FOR n=1 TO 2
5410 PLOT  OVER 1;16+(ly*8),168-
(lx*8): DRAW  OVER 1;31,0
5420 NEXT n
5425 BEEP .01,-10: BEEP .01,-20
5430 IF fx=lx THEN  IF fy-ly>=1
AND fy-ly<=5 THEN  GO SUB 6300
5440 GO SUB 6660
5500 RETURN
6000 REM lib explode
6005 PRINT AT lx,ly; OVER 1;"AB"
;AT lx+1,ly; OVER 1;"CD"
6007 FOR t=1 TO 2
6010 FOR n=1 TO 2
6020 PRINT AT lx,ly; OVER 1; BRI
GHT 1;"HH";AT lx+1,ly; OVER 1; B
RIGHT 1;"HH"
6022 BEEP .05,-50
6025 NEXT n
6027 FOR n=1 TO 2
6030 PRINT AT lx,ly; OVER 1; BRI
GHT 1;"II";AT lx+1,ly; OVER 1; B
RIGHT 1;"II"
6032 BEEP .05,-55
6035 NEXT n
6037 FOR n=1 TO'2
6040 PRINT AT lx,ly; OVER 1; BRI
GHT 1;"JJ";AT lx+1,ly; OVER 1; B
RIGHT 1;"JJ"
6045 BEEP .05,-60
6050 NEXT n
6052 NEXT t
6055 FOR n=1 TO 2: PRINT AT lx,l
y; OVER 1;"  ": PRINT AT lx+1,ly
; OVER 1;"  ": REM clears bright
6057 NEXT n
6060 GO SUB 6400
6070 LET lx=5: LET ly=1
6075 GO SUB 5000
6095 RETURN
6099 REM print fed ship
```



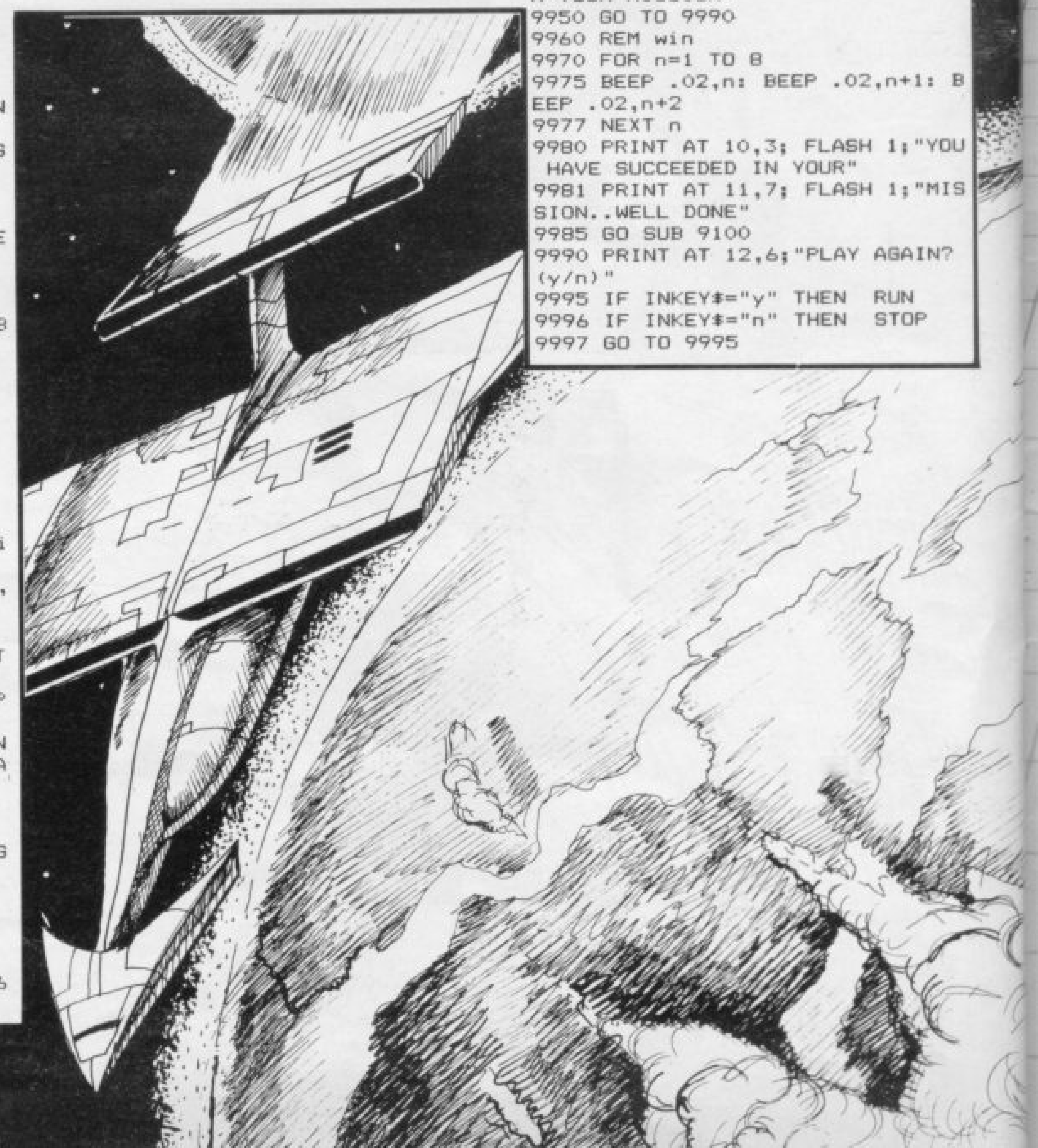
```
6100 PRINT AT fx,fy; OVER 1;"EF"
6110 RETURN
6200 REM federation fire
6203 IF fy<5 THEN  RETURN
6205 FOR n=1 TO 2
6210 PLOT  OVER 1;fy*8-1,172-fx*
8: DRAW  OVER 1;-31,0
6220 NEXT n
6225 BEEP .01,0: BEEP .01,-10
6230 IF fx=lx THEN  IF fy-ly>=1
AND fy-ly<=5 THEN  GO SUB 6000
6240 IF fx=lx+1 THEN  IF fy-ly>=
1 AND fy-ly<=5 THEN  GO SUB 6000
6250 RETURN
6300 REM hit fed
6303 PRINT AT fx,fy; OVER 1;"EF"
6305 FOR n=1 TO 2
6307 PRINT AT fx,fy; BRIGHT 1; O
VER 1;"HH": BEEP .04,-45: NEXT n
6309 FOR n=1 TO 2
6310 PRINT AT fx,fy; BRIGHT 1; O
VER 1;"II": BEEP .04,-50: NEXT n
6315 FOR n=1 TO 2
6320 PRINT AT fx,fy; BRIGHT 1; O
VER 1;"JJ": BEEP .04,-55: NEXT n
6325 FOR n=1 TO 2: PRINT AT fx,f
y; OVER 1;"  ": NEXT n: REM clea
rs bright
6330 LET l=0
6340 LET fx=0: LET fy=0
6350 RETURN
6400 REM damage
6410 LET dam=dam+1
6420 IF dam=6 THEN  GO TO 9900
6430 REM z$ report
6440 PRINT AT 20,7; INVERSE 1;da
m
6450 RETURN
6500 REM lives
6510 LET liv=liv-1
6520 PRINT AT 20,13; INVERSE 1;l
iv
6530 IF liv=0 THEN  GO TO 9900
6550 RETURN
6600 REM diamonds
6610 LET dia=dia+1
6615 LET dp=0
6617 IF dia=10 THEN  GO TO 9960
6620 PRINT AT 20,22; INVERSE 1;d
ia
6625 BEEP .1,0: BEEP .1,20
6627 IF dia<>0 THEN  GO SUB 8380
6650 RETURN
6660 REM energy
6670 LET en=en-1
6675 PRINT AT 20,29;"ig8*2"
6680 PRINT AT 20,29; INVERSE 1;e
n
6690 IF en=0 THEN  GO TO 9900
6700 RETURN
7350 REM exit sect.
7355 GO SUB 8365: GO SUB 8300: G
O SUB 7400
7360 LET mov=1
7370 PRINT AT 19,1;"(30*sp)"
7375 FOR n=1 TO 12: BEEP .02,n:
BEEP .02,n+10: BEEP .02,n*-1: NE
XT n
7380 GO TO 600
7400 REM surf scan cls
7410 FOR n=14 TO 17
7420 PRINT AT n,1;"(30*sp)"
7430 NEXT n
7440 RETURN
7450 REM space mine
7455 FOR n=1 TO 10
7460 LET smx=1+INT (RND*11)
7465 LET smy=4+INT (RND*24)
7470 PRINT AT smx,smy; INK 4;"G"
7475 NEXT n
7480 RETURN
7500 REM planets (stars)
7505 REM system1
7510 GO SUB 8200
7512 GO SUB 8360
7515 FOR n=0 TO 25
7520 CIRCLE 100,100,n/2
7530 NEXT n
7535 GO SUB 7450: GO SUB 8460
7540 GO SUB 8395
7545 GO SUB 8390
7595 RETURN
7600 REM system2
7602 GO SUB 8200
7604 GO SUB 8360
7605 FOR n=0 TO 25
7610 CIRCLE 50,100,n/2
7630 NEXT n
7635 GO SUB 7450: GO SUB 8460
```

continued on page 82



continued from page 81

```
7640 GO SUB 8395
7645 GO SUB 8390
7695 RETURN
7700 REM system3
7703 GO SUB 8200
7704 GO SUB 8360
7705 FOR n=0 TO 25
7710 CIRCLE 150,100,n/2
7715 CIRCLE 90,90,n/4
7720 NEXT n
7725 GO SUB 7450: GO SUB 8460
7730 GO SUB 8395
7735 GO SUB 8390
7795 RETURN
7800 REM system4
7805 GO SUB 8200
7810 GO SUB 8360
7815 FOR n=0 TO 25
7820 CIRCLE 100,100,n/2
7825 CIRCLE 50,130,n/4
7830 NEXT n
7835 GO SUB 7450: GO SUB 8460
7840 GO SUB 8395
7845 GO SUB 8390
7895 RETURN
7900 REM system5
7905 GO SUB 8200
7907 GO SUB 8360
7910 FOR n=0 TO 25
7915 CIRCLE 120,110,n/2
7927 NEXT n
7930 GO SUB 7450: GO SUB 8460
7935 GO SUB 8395
7940 GO SUB 8390
7995 RETURN
8200 REM stars
8210 FOR n=1 TO 50
8220 PLOT 10+INT (RND*230),80+IN
T (RND*85)
8230 NEXT n
8290 RETURN
8300 REM scanner CLS
8310 FOR n=1 TO 12
8320 PRINT AT n,1;"(30*sp)"
8340 NEXT n
8350 RETURN
8351 REM comp.words
8360 LET z$="REAL TIME DRIVE FUN
CTIONING": GO TO 8400
8365 LET z$="EXITING REAL TIME-S
PACE DRIVE": GO TO 8400
8370 LET z$="HIT SURFACE MINE":
GO TO 8400
8380 LET z$="ICE DIAMOND OBTAINE
D": GO TO 8400
8390 LET z$="GROUND SCAN LOCKED
ON": GO TO 8400
8395 LET z$="PLANOSTATIONARY ORB
IT ATTAINED"
8400 REM Zen print out
8405 PRINT AT 19,1;"(30*sp)"
8407 BEEP .01,10: BEEP .01,0
8410 FOR n=2 TO LEN z$+1
8420 PRINT AT 19,n-1;z$(n-1)
8440 NEXT n
8450 RETURN
8460 REM surface
8470 PRINT AT 17,1; INK 4;"(30*i
g8)"
8480 FOR n=14 TO 16: PRINT AT n,
1; PAPER 5; INK 0;"(30*sp)"
8483 NEXT n
8485 FOR n=1 TO 5: LET min=1+INT
 (RND*30)
8490 PRINT AT 16,min; INK 3; PAP
ER 5;"O": NEXT n
8493 FOR n=1 TO 2: LET diap=1+IN
T (RND*30): PRINT AT 16,diap; PA
PER 5; INK 6;"R": NEXT n
8495 RETURN
8500 REM system
8520 LET z$="PLANET SYSTEM ?": G
O SUB 8400
8530 FOR x=4 TO 8
8540 PRINT AT x,2;p$(x-3)
8550 BEEP .02,x: BEEP .02,x+4
8600 NEXT x
8610 IF INKEY$="" THEN  GO TO 86
10
8620 LET k$=INKEY$
8630 IF CODE k$<49 THEN  GO TO 8
610
8640 IF CODE k$>53 THEN  GO TO 8
610
8650 LET sys=VAL INKEY$
8795 RETURN
8800 REM instr. print out
8810 FOR n=1 TO LEN a$
8820 PRINT a$(n);
8840 NEXT n
8850 PRINT
8900 REM initial system var.
8910 LET sys=1
8990 RETURN
9100 REM tune
9110 GO SUB 9185
9120 BEEP .2,19: BEEP .5,19
9130 GO SUB 9185
9140 BEEP .2,19: BEEP .5,14
9150 GO SUB 9185
9160 BEEP .2,19: BEEP .5,19
9170 BEEP .5,22: BEEP .5,20: BEE
P .5,20: BEEP .2,19: BEEP .5,14
9175 FOR n=14 TO 28: BEEP .05,n:
 NEXT n
9180 BEEP .1,30
9183 RETURN
9185 BEEP .5,14: BEEP .5,15: BEE
P .5,17: BEEP .5,20
9190 RETURN
9200 REM display
9210 FOR n=0 TO 21
9220 LET i=2+INT (RND*6)
9230 PRINT AT n,0; INVERSE 1; IN
K i;"(9*sp)BLAKE'S SEVEN(10*sp)"
9235 BORDER i
9240 NEXT n
9250 RETURN
9600 REM u.d.gs
9610 FOR z=144 TO 161
9620 FOR n=0 TO 7: READ k: POKE
USR CHR$ z+n,k: NEXT n
9630 NEXT z
9640 DATA 0,63,62,24,24,124,255,
255,0,224,0,0,0,0,224,255,127,30
,30,51,115,252,255,0,224,0,0,128
,248,0,192,0
9650 DATA 0,0,7,127,7,0,0,1,30,1
4,255,255,255,14,28,254
9660 DATA 129,90,60,36,36,60,90,
129
9680 DATA 153,90,60,63,252,60,90
,153,0,73,42,28,126,52,82,0,0,0,
36,24,24,36,0,0
9690 DATA 36,36,255,36,36,255,36
,36
9695 DATA 24,24,48,88,20,24,20,3
4,24,24,20,60,80,16,40,72,24,24,
12,26,40,24,40,68,24,24,40,60,10
,8,20,18
9700 DATA 60,36,72,164,226,36,34
,65
9705 DATA 0,0,0,0,24,24,60,126
9710 DATA 0,0,0,16,56,116,56,16
9790 RETURN
9800 DIM p$(5,29)
9810 FOR x=1 TO 5
9820 READ p$(x)
9830 NEXT x
9850 DATA "SYSTEM 1 BASE PLANET
ARISTO","SYSTEM 2 BASE PLANET AM
ERSAT","SYSTEM 3 BASE PLANET EAR
TH"
9860 DATA "SYSTEM 4 BASE PLANET
CEPHLON","SYSTEM 5 BASE PLANET C
ENTERO"
9890 RETURN
9900 REM lose
9910 FOR n=20 TO -20 STEP -1
9915 BEEP .01,n: BEEP .02,n-5
9920 NEXT n
9930 PRINT AT 10,11; FLASH 1;"GA
ME OVER"
9940 PRINT AT 11,3;"YOU FAILED I
N YOUR MISSION"
9950 GO TO 9990
9960 REM win
9970 FOR n=1 TO 8
9975 BEEP .02,n: BEEP .02,n+1: B
EEP .02,n+2
9977 NEXT n
9980 PRINT AT 10,3; FLASH 1;"YOU
 HAVE SUCCEEDED IN YOUR"
9981 PRINT AT 11,7; FLASH 1;"MIS
SION..WELL DONE"
9985 GO SUB 9100
9990 PRINT AT 12,6;"PLAY AGAIN?
(y/n)"
9995 IF INKEY$="y" THEN  RUN
9996 IF INKEY$="n" THEN  STOP
9997 GO TO 9995
```



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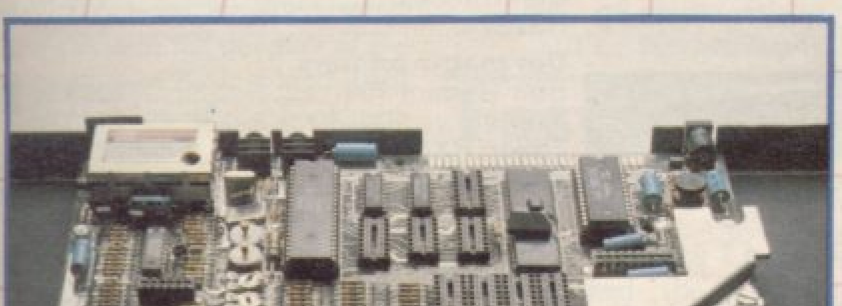
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Contents

On page 86 Mike Wright dips into a mixed bag of specialised software and business books.

Below readers take companies to task.

SINCLAIR BUSINESS USER

September 1984

The good, the bad and the utterly indifferent

I CONSIDER my self a serious user and soon after I had my ZX-81 I bought a Memotech interface enabling me to produce proper invoices through a home-made program.

I wanted more memory to interconnect the customer file and the invoicing program. Having been assured by Cheetah that its 64K could be amended I discovered later it was impossible without a diagram to disable the 8 to 16K RAM section as it clashed with the Memotech. A number of letters and phonecalls later produced a written refusal to supply the relevant details. By that time I was ready for the Spectrum so I decided to leave the matter.

Transferring the two programs was simple enough so everything plus a lot more now runs on the Spectrum. I discovered the delights of Betasoft Beta Basic which made the writing of my bookkeeping program easier. I was amazed meanwhile to discover the latest version 1.8 to be so much superior over version 1.0 which I already considered to be a true masterpiece.

To hook up my printer I obtained a Euroelectronics Interface and with East London Robotics offering 80K Forth I thought this would be a good buy. That turned out to be a huge mistake.

Having installed the chips they turned out not to work. It turned out there was an incorrect instruction in the documentation and a description on how to implement the OUT instructions as advised in the sales brochure was not there either. In addition the printer interface also refused service.

Since ELR did not bother to reply to a letter sent I tried the phone again and eventually was told their unit was 100 per cent compatible and I should take up the matter with Euroelectronics. They replied.

Are the above points typical for the various add-on suppliers?

J H Kuiper,
Amsterdam,
The Netherlands.

Taswords of praise

SOME TIME back I bought Tasword and the Tasman Centronics interface for my Spectrum and Seikosha CP-250X printer.

Even though I was happy with all the Tasword and Tasman facilities I missed not being able to COPY screens. I therefore wrote to Tasman. Not only did they send me the necessary software but they also did not charge me.

With this kind of attitude I can only wish them well and I will definitely recommend their products and company.

R C Stockton,
Johannesburg,
South Africa.

Small is beautiful in customer service

MY INTEREST is mainly in business applications, and it is less than a year since I began to use a Spectrum to see what was possible. I had no prior knowledge or experience of computing. During the last eight months or so, after buying items of software and hardware, I have needed to write or telephone for help, and I still get great pleasure in this age when so many, usually big, organisations do not care, to find so many small ones which do.

Inevitably I will miss out some who deserve inclusion but those which merit special mention for products and after-sales help are Campbell Systems — Masterfile and MF-Print; Tasman Software — Tasword Two; Kempston Micro Electronics — Centroic Interface; and Oxford Computer Publishing — Finance Manager and Master Tool Kit. I am sure their other programs and products are equally good, but I list only those I have used.

After enquiries prompted by articles and advertisements in your June issue Transform Ltd have been very quick to respond on several occasions. Alas, I am still waiting to hear from Saga Systems about its keyboard, and from Prism Microproducts about its modem.

Softek International still have my self-addressed stamped envelope sent on 23rd March. The package and "manual" for the IS compiler sent back at the same time because of a bug was returned with the same "bug" without comment.

I suppose there had to be a "hit list", so I am indeed grateful for the small men.

L R Thwaite,
Stockport, Cheshire.

Software companies are finding new uses for the Spectrum. Mike Wright examines less-publicised products

Serious software for specialised use

A GREAT DEAL of interest has been focused recently on the educational uses of home computers. At the same time there has been a less well-publicised rise of interest in the serious uses of machines such as the ZX-81 and Spectrum.

Major companies such as Plessey lead the way using ZX-81s with a Forth ROM to run and control manufacturing equipment. Software houses which are traditionally games-based, such as Richard Shepherd, Quicksilva and Visions, have all released applications software. While the majority have been word processors, databases, spreadsheets or financial packages, other more specialised programs are also available.

Heathplanner from Heath Computing is an appointments planning program costing £12. There are two programs included on the cassette. On side one is the instruction program, while the main program is on side two. Once the instructions are loaded the choice of stepping through the pages one at a time or of jumping to a particular page is presented.

The second page advises the user to make notes as he proceeds, yet when eventually I reached page 16 I found that I could have printed any of the pages by entering P. That seems to typify the instructions, which I found poorly written and difficult to understand.

Up to a maximum of 126 clients can be included but that number shrinks if a client has more than one appointment in a week, as you have to set up a different client code for each appointment. Each client is denoted by a code consisting of two letters and a number, e.g., HC1 may stand for Heath Computing.

The addition of new clients or the deletion of old ones is simple. A + (to add) or − (to delete), followed by the client code, is entered and that can be done from almost any position in the program. When a new client is added, up to two lines of extra information, which will usually be name and address or telephone number of the client, can also be specified.

Then the client's availability for appointments can be entered. To do that each day of the week is divided into 14 periods; the times of the periods are not defined, leaving it to the user's preference. The days are also numbered from 1 to 7, with Monday as 1. A possible appointment can then be input as, for example +109 or +701, i.e., for the ninth period on Monday or the first period on Sunday. A list of them can be entered, with the last entry being considered as the optimum time for the client. Appointment options can be deleted in a similar way by using a − instead of +.

Clients with no appointment due in a particular week can be deferred. The choices allow the week number of their next appointment to be specified or, if a week number greater than 53 is used, to defer appointments indefinitely.

The details on any or all clients can also be examined, giving an alphabetic list of client codes or a summary list which shows details of any deferments, the number of possible appointment periods, the optimum period and part of the first line of notes. A chart showing the possible appointments for a client can also be displayed.

Once all the data on clients and the appointment times has been fed in, the program can be set to plan the week's appointments. In doing so, account is taken of client preferences and allowances made.

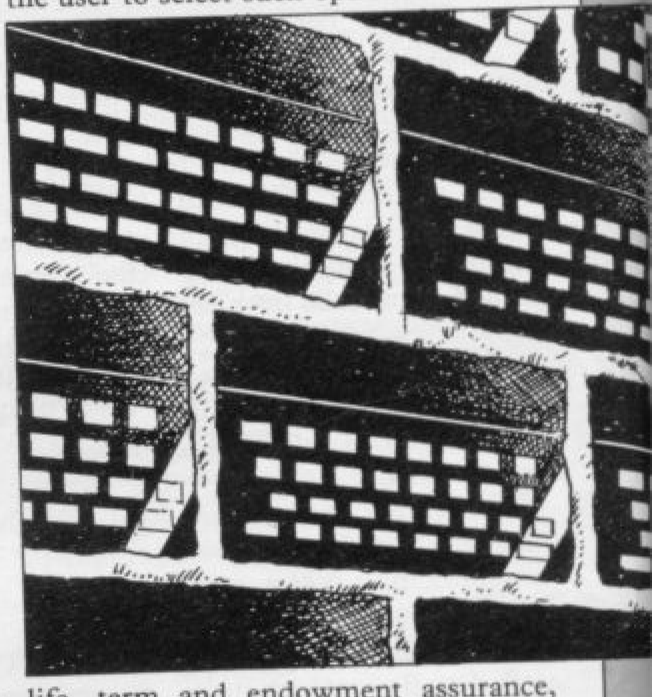
Depending on the complexity of the problem, that planning could take a long time. If the program finds more than one client who can make only one particular period, it will defer one of them until the following week. That, of course, makes no allowance for the importance of particular clients or the possibility of arranging alternative times. To do so would mean returning to the program to alter appointment times.

One more feature is the inclusion of a jottings page which allows up to 19 lines to be used for making notes, such as the client's holidays or special promotions. They can be incorporated later into the planning of appointments.

My first impressions of Heathplanner were entirely unfavourable. I found the instructions poorly written and found the main program difficult to load. As it reached the end of loading I kept getting Tape loading error. Once I had it loaded and saved it again I had no more difficulty. I then started to experiment with the sample data supplied and an understanding of the structure of the program and what I could, and could not do, was soon apparent.

Overall, the more I used the program the more I grew to like it but I still prefer to do my planning using a diary.

For insurance salesmen who wish to improve their sales pitch, Inform Software has produced **Investment, Insurance, Information.** The program consists of a main menu which allows the user to select such options as whole



life, term and endowment assurance, home, health and travel insurance, pension plans, business/commercial insurance and investment information.

Selecting most of the options leads to a list of the types of policies which can be provided by any bank or insurance broker. In some cases, calculations are done but seem to be designed to show the benefits of taking insurance today rather than tomorrow. I would not recommend the program to the casual user

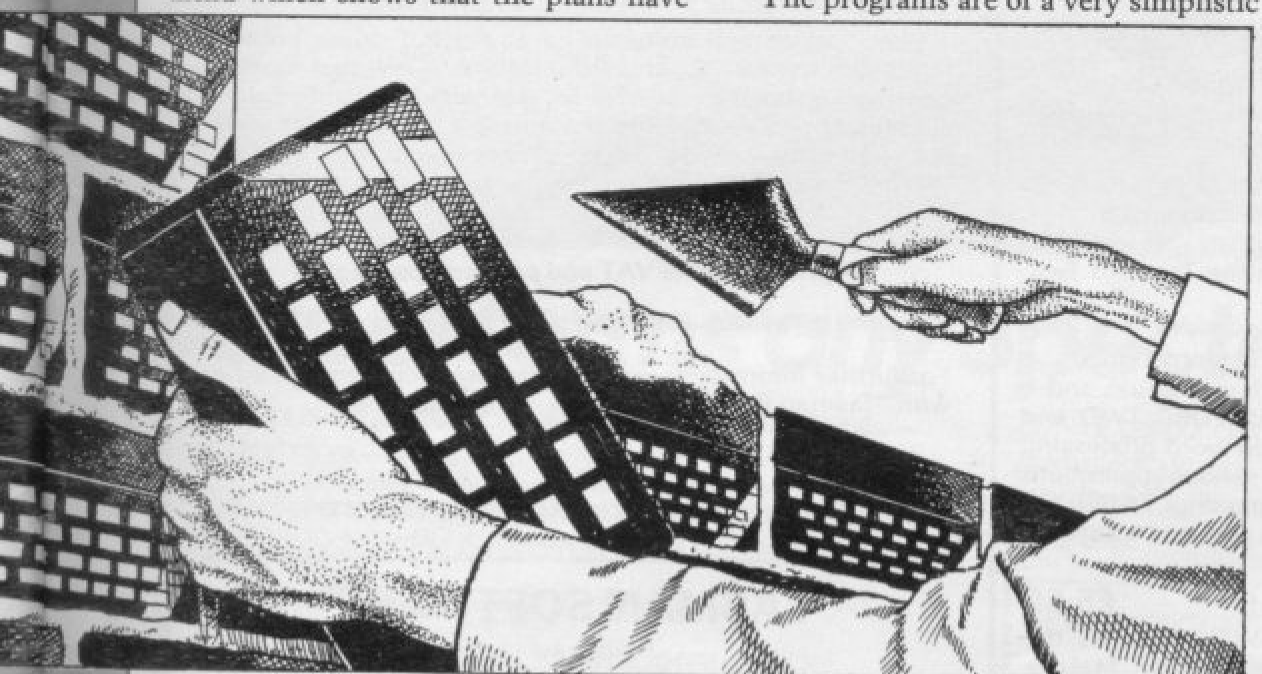
who wishes to see what possibilities exist for insurance or investment. As a selling aid for trained brokers or salesmen it could be useful, although the problem exists of updating the figures constantly. The version received for review was an early one and no price was quoted.

One question faced by many builders, and DIY fanatics intent on building their own extensions, is how much it will cost. **Building Price** from J Redman is a useful program which could provide the answer. Like Heathplanner, the instructions consist of a separate program which must be loaded and read before the main program is loaded.

On loading the main program the plans are entered. The program leads the user step by step, asking for measurements for the building, starting with the foundation width and ending with the height of the first floor.

Once the measurements are entered a plan of the building is drawn and the directions of the joists sought. They are also drawn on the plan, which can then be printed. Constructing the floor plans is done next, followed by a question-and-answer session which provides the program with any extra data it requires on tiles and the like.

The user is then returned to the menu which shows that the plans have been entered and offers the choice of listing the materials, the area covered or the complete details, as well as the price calculator and save file options.



The total cost is calculated by working through another question-and-answer session, in which the user must input the cost of the materials as they are prompted. The program also allows estimates of wastage to be made for each material and takes that into account when determining the cost. At the end a total cost of the materials is calculated.

Provided you are familiar with the terms and methods of the construction industry, the program could save time and worry with your calculations. Unfortunately we were sent no details of the cost or availability of the program.

For readers interested in writing applications software two books may be of interest. The first is *Putting Your Spectrum to Work* by Chris Callender, published by Interface Publications at £4.95. At first glance it looks a big disappointment. It seems to consist solely of program listings which have been photocopied from the printout of a ZX printer, with little in the way of explanation as to how the program is constructed or works.

Included are programs for a database, spreadsheet and word processor. Other programs include ones for drawing graphs, keeping accounts, stock control and electric circuit design. In all, there are 15 programs. The final program, Boss, shows how several of the programs can be merged to provide a complete system. Although they have all been written primarily for the 48K Spectrum, the final chapter gives a list of modifications, where necessary, for the programs to run on the 16K version.

The programs are of a very simplistic nature but provide an insight into how to start writing programs for serious uses. The biggest problem I found with the book was following the listings as I was typing them in but those I entered work first time.

The second book is *Business Programming on your Spectrum* by Peter Jackson and Peter Goode, published by Phoenix Publishing Associates at £6.95. It is designed for sales and marketing managers and that is reflected in the programs listed. The style is different from that of Callender. It starts with a gentle introduction to Basic programming and the principles of programming, before starting on the first of the seven programs included.

The programs are for adjusting a sales trend, drawing graphs, forecasting sales, keeping customer records, tracking sales and, like the other, a program which packages the others. Critics could argue that the chapters on Basic programming and its principles are too short — they are in 36 pages — for a complete novice but they are remarkable for the clarity and conciseness with which they cover the subject.

For each program an introduction provides a short description which covers how the program works and why it is a suitable area for using a computer. A description and, in some cases, a flow-chart of the program is given before the listing. Jackson's programs are more complex and are approximately twice the length of Callender's but length is not necessarily a measure of program capability.

The overall quality of the printing and presentation of *Business Programming* is superior to *Putting Your Spectrum to Work* and although the listings have been produced from a dot matrix printer, they are much clearer and more readable. I found them easier to follow when typing them in.

The two books are aimed at different markets and as such should be considered independently. *Putting Your Spectrum to Work* is an excellent book as far as it goes. It would have been improved by the use of a better quality in the reproduction of the listings and by including more description of the workings of the programs but the number and variety of the programs compensates for that.

Although *Business Programming* is aimed at a smaller section of the market, it provides sufficient scope to make it of interest to a wider group of businessmen. Both books should make a useful addition to the bookshelves of most businessmen who want to write programs or who seek a clearer understanding of how some of their commercial programs work.

Heath Computing, 7 The Meadows, Flackwell Heath, Bucks HP10 9LX.
Inform Software, 3 Treesdale Close, Birkdale, Southport PR8 2EL.
Interface Publications, 9-11 Kensington High Street, London W8 5NP.
Phoenix Publishing Associates Ltd, 14 Vernon Road, Bushey WD2 2JL.

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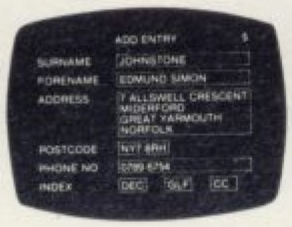
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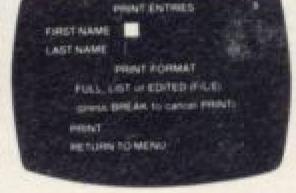
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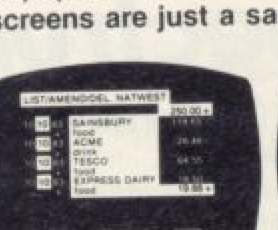
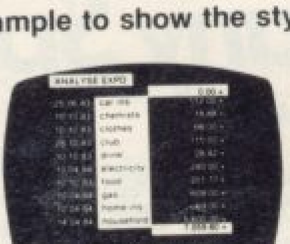
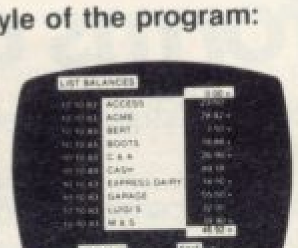
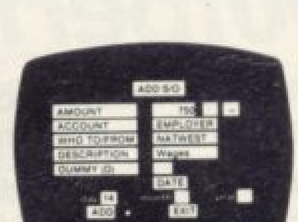
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THE QL COMPUTER reviewed in the July issue of *Sinclair User* was one of the first to go to customers. Since then Sinclair Research has produced several other versions, the latest of which contains the 48K ROM upgrade with which the company seems satisfied. It seems appropriate, therefore, to look at the machine in the light of those recent modifications.

The computer may not look different from the outside, although some keys on the keyboard still bounce and cause letter-repeat but the software has changed dramatically.

Most noticable are the changes in QDOS, the multi-tasking, time-slicing operating system which takes care of the microdrives and the other peripheral devices.

The two drives are at least twice as fast on the new version than they were on the original. Their independence from other devices under the multi-task system is also more apparent. After 10 to 15 seconds of drive operation, when SAVEing a program, the keyboard goes back into operation and it is possible to type in the next command before the microdrive finishes its previous task.

You can also stack SuperBasic commands to devices such as microdrives. One command is executed after another but the job scheduling part of QDOS will execute the tasks as if they are all running together. It is impressive to watch and saves time on a slow machine.

The Sinclair decision to use the 68008 as the main processor has been debated and criticised by certain sections of the press. The reason is that many journalists are annoyed because Nigel Searle is calling the QL a 32-bit machine. They see it as an 8-bit micro with 32-bit internal structure. While that is correct it would have been confusing to put 32/8-bits on the specification. Sinclair may have chosen the bigger number but that is all part of the sales pitch and is not untrue.

The argument about the chip specification is a little pointless, as the 68008 can still handle 32 bits of information. It has to do it in smaller blocks and, as a result, the chip works slightly slower than the 68000 or its bigger brother, the 68032. There is no reason why the QL should not handle software which has been written for those other two processors and that puts the machine into a new league of computers in terms of chip compatibility and programming.

The internal structure of the QL makes SuperBasic slower than it could be but the language is still one of the most innovative and powerful Basic interpreters on the market. The structured format, which has changed several times since the original specification was released, is compatible with BBC Basic and also includes a set of turtle graphics commands which are a great improvement on the original.

In the original *Sinclair User* review of the QL it was stated that the program editing facilities of the computer were appalling. The latest model provides better commands but the QL still has only a line editor. No full-screen editor is provided, which is a pity, as it would have been easier to operate.

The new editor traps lines which contain errors and send them back to the editing window for correction. You can either erase them completely or scan the line and do the correction.

SuperBasic may be slow but the number-crunching abilities of the QL, in which many people in the business and scientific community will be interested, puts it in the middle of the serious professional market if nothing else does. It can out-calculate machines such as the Apple II and IIe and also the IBM PC and it can do it in almost three-quarters of the time.

That opens new fields of use in the engineering and scientific industries. The 68008 will also provide plenty of scope for students in those areas who need inexpensive computing power.

The so-called window facility provided by Sinclair on the QL cannot be ignored in the hope that it might go away. The computer does not provide real windowing which can be found on the bigger, and more expensive machines, such as the Apple Macintosh or Lisa.

True windowing requires extra hardware which costs money and which is not available on a low budget machines such as the QL. The Sinclair computer uses a software technique to create the windows which might better be described as display areas connected to channels through which information, such as listings, can be sent to the screen.

The QL windows, while being attractive and impressive to beginners, have little to do with multi-tasking, as Sinclair would first have had users and journalists believe. You cannot run several SuperBasic listings together on the machine, even if you put them in separate windows.

Although it is still easy to gloss over the QL marketing policy, it is difficult to find drastic faults with a product which costs £400 and offers professional computing power, albeit at the low end of the market.

The QL still has its fair share of bugs and they will have to be ironed out. It is, however, beginning to fulfil the potential which it had when first launched.

Sinclair should not be complacent. Software and hardware support must be produced quickly and in great quantities or other manufacturers, such as Acorn or Spectravideo, will jump on the 16- or 32-bit bandwagon. Sinclair Research has a narrow lead which could be eroded. If the company does not get it right this time it may not have the opportunity to try again.

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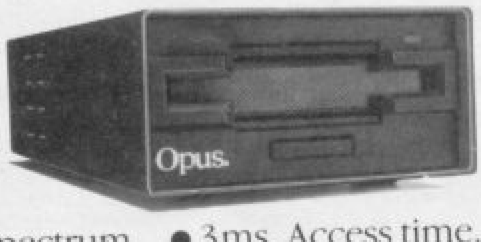
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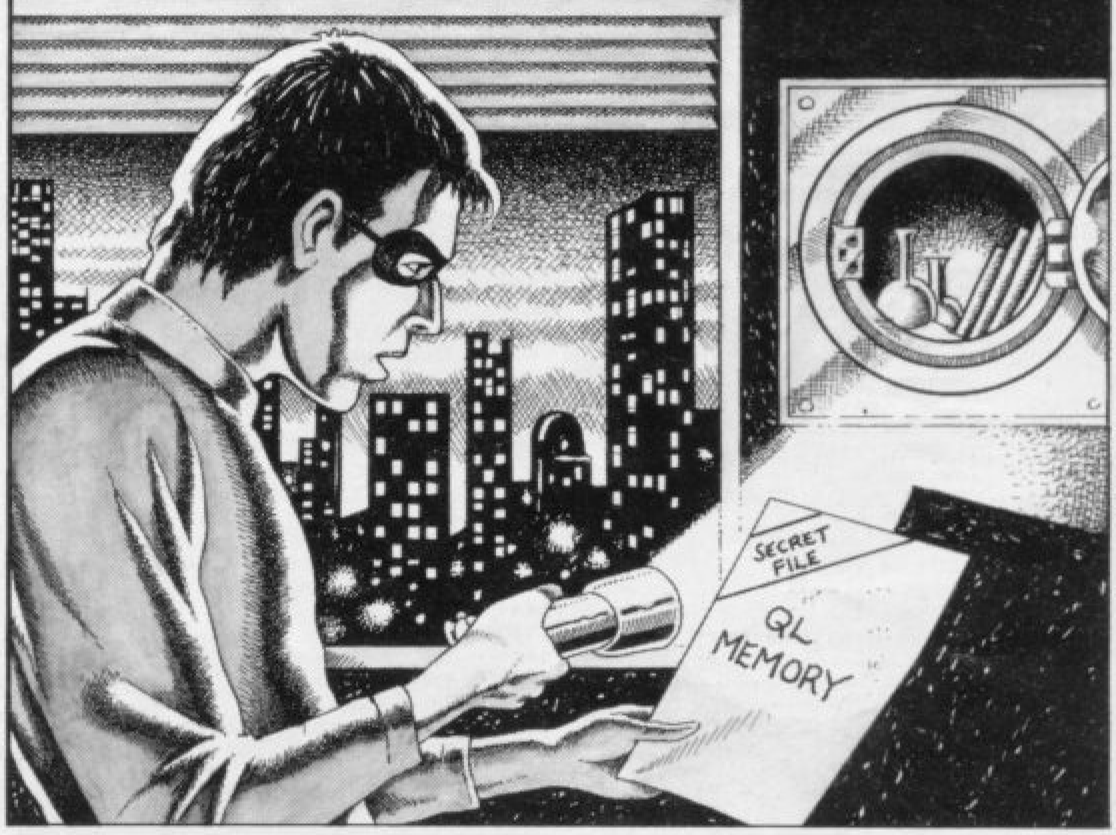
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Secrets of the QL memory

The organisation of ROM and RAM provides an insight into the new machine's abilities. Eric Cowsill provides the answers



SINCLAIR has a winning combination — a new more powerful computer, a revolutionary operating system, a new dialect of Basic, and, most important, has taken away the drudgery of wading through a manual to try to discover how it works.

It seemed that the best plan would be to delve into the QL memory and find which addresses are used by the system and where the program area lies. A short program such as that shown in listing one is all that is needed to discover that the memory is divided between ROM and RAM, roughly as shown in figure one.

That program could, of course, be changed to given a more detailed look at key parts of the QL memory. Listing two shows a single Basic monitor program which evolved from the desire to do something useful while idling away the hours discovering the syntax of SuperBasic by trial and error.

The screen layout of the program will be the same, whether F1 or F2 is selected on power up. Line 90 alters the dimensions of the default output channel — channel one — so as to give the best display. Three options are provided from the menu display: an area of memory, alter an area of memory — placing the same value in each location, and quit to leave the program. The selection is made by pressing the key corresponding to the first letter of the required option. Notice the use of SELect to determine appropriate action.

If the 'display' option is chosen you will be asked to give the address from which you want the display to start. The PROCedure address will accept an input either in decimal or prefixed by '$', in hex. The procedure is not entirely mug-trapped but will eliminate the most likely causes of invalid inputs.

Listing 1

```
5 CLS
10 i=1024
20 FOR j= 0 TO 256
25 x=j*i
30 a=PEEK(x):POKE x,65
35 PRINT j;"K ";PEEK(x);" ;"
40 POKE x,a
45 NEXT j
```

This routine provided an interesting exercise in discovering how the QL handles strings. In its turn, address calls up another procedure to evaluate the string as a number, which is then returned as a value in the variable i.

The next action is a call to the PROCedure display. That will show 24 rows, each displaying the contents of 16 memory locations. Those values are shown in hex. Where they correspond to a printable character that is also displayed.

The display of printable characters makes it a relatively easy task to find the keywords in ROM, the Basic program area and the RAM used for string storage, buffers and system variables.

When the display is complete, three options are available. 'Up arrow' will show the area of memory immediately preceding that displayed. Similarly, 'down arrow' will show the block of memory immediately following. 'L' returns to the main menu.

If 'Alter' is selected, three values are requested. They are the start and end addresses and the value to be placed in those locations. The area which has been altered is then displayed automatically as soon as 'Alter' has been executed.

Working systematically through the QL memory will reveal more about the machine but figure two will highlight the areas which are likely to prove of interest.

The other purpose in writing the program was to try to discover how some of the SuperBasic works. Four of the programming techniques used will be of particular interest.

The string-handling capabilities are very interesting but not yet fully-implemented. Some of the string-handling functions lead to error messages or even program crashes, although on another program RUN they may operate perfectly well. That serves to demonstrate the temporary and incomplete nature of the existing ROM. It seems that if string slicing is to be effected it is necessary to DIMension a string array. The DEFined PROCedure address demonstrates the use of string slicing operations to eliminate invalid inputs.

The use of DEFine PROCedure in place of the usual form of subroutine has the advantage that the routine can be called by name — whether from the main program or from another procedure — rather than by, e.g., 'GOSUB

continued on page 96

Listing 2

```
10 REMark **********************
15 REMark BASIC MONITOR PROGRAM
20 REMark   FOR SINCLAIR  QL
25 REMark    Eric Cowsill
30 REMark   MAY  1984
35 REMark **********************
90 WINDOW #1,472,256,30,0
100 CSIZE 0,0:MODE 0
102 DIM hx$(6):DIM in$(10)
105 REPeat main
107  CLS #1
110  PRINT " BASIC MONITOR";
112  PRINT " PROGRAM"
120  PRINT:PRINT
130  PRINT "Select from:-"
140  PRINT "   Display"
145  PRINT "   Alter"
150  PRINT "   Quit"
155  REPeat kbd1
160   inp$=INKEY$
162   IF inp$<>"" THEN EXIT kbd1
165  END REPeat kbd1
170  inp=CODE(inp$)
180  IF inp >95 THEN inp=inp-32
190  SELect inp
200   ON inp = 68
201    CLS #1:PRINT
202    PRINT "Start address ?"
203    address 6:display
205   ON inp = 65:alter:display
210   ON inp = 81:EXIT main
230  END SELect
235 END REPeat main
240 STOP
1000 REMark **********************
1010 DEFine PROCedure display
1015  REPeat show
1020   FOR j=i TO i+368 STEP 16
1030    x=j:dechex 5
1040    PRINT hx$(1 TO );"  ";
1050    FOR k=0 TO 7
1060     x=PEEK(j+k)
1065     dechex 2
1070     PRINT hx$(1 TO 2);" ";
1080    END FOR k
1085    PRINT "  ";
1090    FOR k=8 TO 15
1100     x=PEEK(j+k)
1105     dechex 2
1110     PRINT hx$(1 TO 2);" ";
1120    END FOR k
1125    PRINT"  ";
1130    FOR k=0 TO 15
1140     x=PEEK(j+k):ptchar x
1150    END FOR k
1160    PRINT
1170   END FOR j
1180   PRINT "up- preceding ";
1181   PRINT "block  down-next";
1182   PRINT " block   L-leave";
1183   PRINT " function"
1184   REPeat kbd2
1185    q$=INKEY$
1190    q=CODE(q$)
1195    IF q=108 THEN q=76
1200    SELect q
1210     ON q=208:i=i-384
1215      EXIT kbd2
1220     ON q=216:i=i+384
1225      EXIT kbd2
1230     ON q=76: EXIT show
1250    END SELect
1260   END REPeat kbd2
1280  END REPeat show
1290 END DEFine
1300 REMark **********************
1310 DEFine PROCedure alter
1320  CLS:PRINT
1322  PRINT "Alter memory from?"
1324  address 6
1330  a1=i
1340  PRINT
1342  PRINT "End address?"
1344  address 6
1350  a2=i
1358  PRINT
1360  PRINT "Value to insert?"
1362  address 3
1370  val=i
1380  FOR a=a1 TO a2
1382   POKE a,val
1383  END FOR a
1385  i=a1
1390 END DEFine
1400 REMark **********************
1410 DEFine PROCedure address (digit)
1415  PRINT "Enter address in ";
1420  PRINT"decimal or ";
1422  PRINT "prefix with '$'";
1425  PRINT " and enter in hex."
1426  NPUT in$
1427  l=LEN(in$):hd=0
1428  k=1
1429  REPeat lead
1430   IF l<=digit THEN EXIT lead
1431   IF k>digit THEN EXIT lead
1432   m=l+k-digit
1433   LET in$(k)=in$(m)
1434   k=k+1
1435  END REPeat lead
1436  in$=in$(1 TO 6)
1437  FOR k=1 TO LEN(in$)
1438   in=CODE(in$(k))
1439   IF in=36 THEN hd=1
1440   IF in>96 THEN in=in-32
1441   IF in>70 THEN in=48
1442   IF in<48 THEN in=48
1443   in$(k)=CHR$(in)
1444  END FOR k
1445  SELect hd
1446   ON hd = 0:eval
1447   ON hd = 1:hexdec
1450  END SELect
1460  REMark Digit specifies max
1462  REMark  length of in$
1490 END DEFine
1500 REMark **********************
1510 DEFine PROCedure dechex (places)
1520  hx$=""
1530  FOR z=places-1 TO 0 STEP -1
1540   y=INT(x/16^z)
1550   x=x-y*16^z
1560   IF y>9 THEN y=y+7
1570   y=y+48
1580   hx$(places-z)=CHR$(y)
1590  END FOR z
1592 REMark Places specifies
1593 REMark  number of hex
1594 REMark  digits to be
1595 REMark    returned
1597 END DEFine
1600 REMark ******************
1610 DEFine PROCedure hexdec
1620  i=0
1630  j=LEN(in$)
1635  FOR k=j TO 1 STEP -1
1640   a=CODE(in$(k))
1650   IF a>57 THEN a=a-7
1660   a=a-48:i=i+a*16^(j-k)
1670  END FOR k
1690 END DEFine
1700 REMark ******************
1710 DEFine PROCedure eval
1720  i=0: j=LEN(in$)
1730  FOR k=j TO 1 STEP -1
1732   a=CODE(in$(k))
1734   IF a<48 OR a>57 THEN a=48
1740   i=i+(a-48)*10^(j-k)
1750  END FOR k
1760 END DEFine
1800 REMark ********************
1810 DEFine PROCedure ptchar (x)
1830  IF x<32 THEN x=46
1840  IF x>128 THEN x=46
1850  PRINT CHR$(x);
1860 END DEFine
1870 REMark ********************
```

continued from page 95

1000'. That means that the program to some extent is self-documenting provided names are chosen sensibly.

The procedure begins with DEFine PROCedure name and terminates with END DEFine instead of RETURN. The disadvantage of that simple structure is that because it can be called simply by name, SuperBasic will often fail to detect errors in entering keywords, assuming instead that a procedure is to be called.

Notice the way in which parameters — values — can be passed to, and for that matter from, PROCedures. The PROCedure address expects a value to be passed to it which will be the value of the variable digit — see line 1410. That value is passed when the PROCedure is called by placing the relevant value after the PROCedure name — see lines 1320, 1340 and so on.

REPeat name is used at the beginning of a program loop. Execution of the program will continue with the instruction following the REPeat instruction when END REPeat name is reached. That eliminates many occurrences of GOTO. For example, in line 235 of the monitor program END REPeat main could be replaced by GOTO 107. The program will break out of the loop when EXIT name is encountered — see line 210. The writer found that the REPeat name had to be on a line of its own, otherwise the program seemed to end in continuous loop.

SELect n introduces a powerful structure to enable multiple branches to be selected. The statement is followed by a number of conditions. A sequence of instructions may follow each condition but only if the condition is true will the instructions be executed. Execution of the program will then continue at the instruction following END SELect. Notice the mopping-up condition ON n — REMAINDER. The instructions following that condition will be executed if the value of the variable is not one for which an alternative course has been specified.

The SELect n structure corresponds in certain respects with IF . . . THEN . . . ELSE IF . . . THEN. It has, however, some advantages over this alternative. The sequence of instructions to be executed can continue on separate lines which again reduces the need for GOTO statements.

That structure is used several times in the monitor program, for example in lines 190 to 230. It appears to work only with a numeric variable and where the condition is expressed in the form ON n = n1 rather than ON n < n1 or ON n > n1.

Time, no doubt, will provide the answers as to how best to use the no doubt very powerful SuperBasic commands and structures.

● *Since the article was written the writer has received a copy of the QL manual. One or two minor amendments to the program have been incorporated but there are still no solutions to the string-handling problems referred to. It seems we will have to wait until the dongle in the cartridge port is replaced by the final version of the ROM.*

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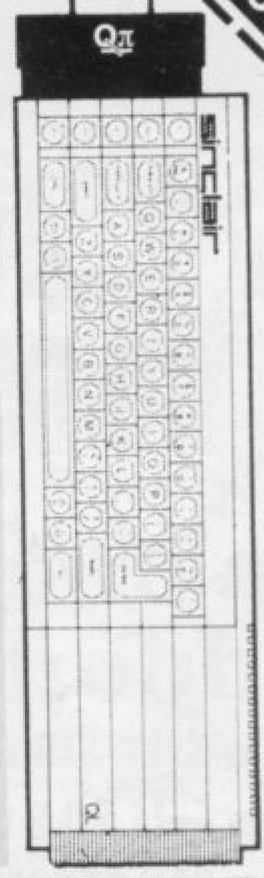
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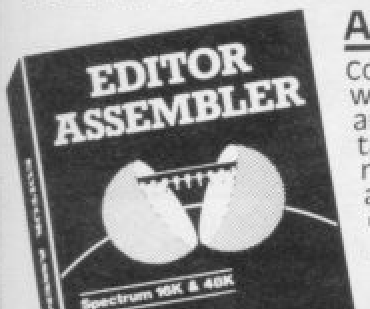
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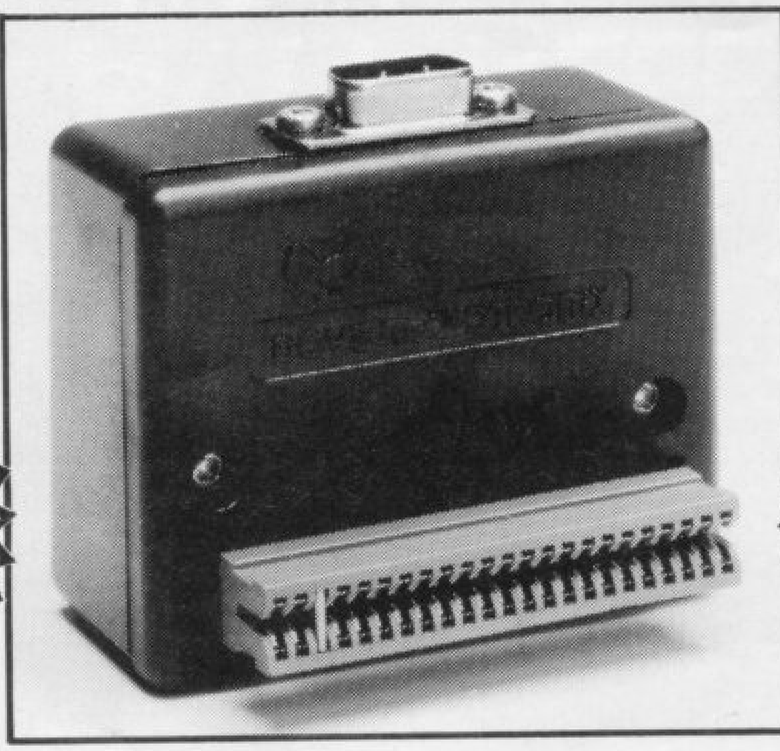
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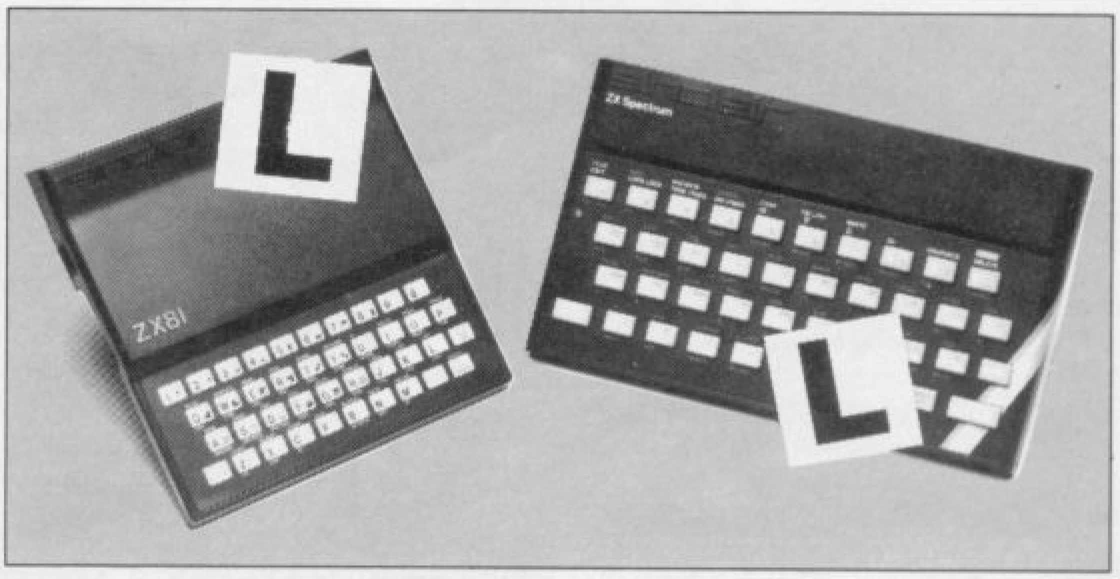
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GLOSSARY

Basic — Beginners' All-purpose Symbolic Instruction Code. A programming language resembling English which is used by beginners because most popular microcomputers have it as standard.
Bug — an error in a program.
EPROM — Erasable Programmable Read-Only Memory. Semi-permanent storage. Information is not erased if the power is turned off in the computer. Programs can be erased by subjecting the memory chips to ultraviolet light. The memory can then be re-programmed using an electrical device called an EPROM blower.
Interface — RS232 and Centronics. A device which enables other computers or add-ons, such as printers, to be connected to the computer. It converts non-standard signals from add-ons to the standard signals of the computer in use.
Kilobyte — (K). A measurement of memory size. Most machines use 16K as a minimum but 48K is generally agreed to be necessary for serious work.
Machine code — an electronic pulse code used by the computer to perform functions and communicate with memory and other devices.
Mnemonics — abbreviated instructions — for example LD for Load — used in machine language programming.
Motherboard — an external printed circuit board which is used like a multi-way plug planner. It enables other printed circuit boards, such as graphics boards and colour boards, to be slotted-in.
Port — a link to the outside world which can be used by programs and the computer.
PCB — printed circuit board. A board which has on it the electronic circuits of the computer.
RAM — Random Access Memory. Information and programs can be stored in this type of memory as electronic pulses which conform to a set of numbers — machine language — in which programs are represented in the computer. When the power is turned off the information will be lost.
ROM — Read Only Memory. Information stored in this type of memory is not lost when the power is switched off.
Software — programs which control the operation of the computer.
Syntax error — a bug caused by incorrect use of a programming language.



Our easy-to-follow guide for new owners

The basic route to a habit-forming hobby

BUYING a Sinclair machine can be the start of a life-time's obsession with home computing. It is easy, however, to become discouraged if everything does not go according to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the machines is to abandon any ideas for special uses. While the 48K Spectrum is big enough for simple uses in small businesses, the range of Sinclair computers does not contain machines for major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking your machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for one second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

If you have a Spectrum you will have received an introductory booklet which explains what the computer can do and giving detailed instructions on how to set it up. Also included is a fault-finding guide.

Once the K appears you are ready to begin learning about your machine. It can prevent family arguments if you can afford a separate television set for your system. It also makes life easier if you find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads.

When using a Spectrum, a television set has to be more finely-tuned than when using a ZX-81 because of the added dimension of colour. If the set is not tuned properly, the colours will look hazy instead of sharp and clear. If no colour can be seen when it is switched on, the power supply or the television set may be at fault.

Some users have experienced some difficulty with some television sets, which include Hitachi, Grundig and Toshiba. Sets which many people have found compatible include the Sony Trinitron, Fidelity and Ferguson. Recent changes in the ULA should make more sets compatible.

The manuals are written in great detail and are reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are ready but that is likely to lead to errors. For example, words like AND, THEN and AT should not be typed-in letter by letter.

By the time you have reached chapter 11 in the ZX-81 manual and chapter 19 in the Spectrum manual you should have accumulated sufficient knowledge to be

continued on page 102

continued from page 101

able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is important when using the ZX-81 that it is not jolted. Some of the connections can easily work loose and everything which has been entered will be lost.

The manuals are not to everyone's liking and if you find them difficult to follow a number of books on the market can help you. Find the one which suits you best.

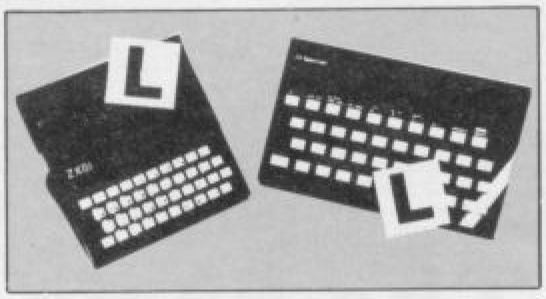
As a way of relaxing you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy.

For the ZX-81 there are a few tapes for the unexpanded 1K machine but the majority require the 16K RAM pack. Similarly on the Spectrum most companies are taking advantage of the possibilities provided by the larger 48K machine rather than providing cassettes for the 16K.

The tapes can vary in quality and it is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about both the ZX-81 and the Spectrum is to plunge in at the deep end and see what the machines will do. Refer to the manuals when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machines.

You may already have heard about the problem involved in SAVEing and LOADing your own cassettes. The manual gives detailed instructions but many of the early ZX-81s would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.



Usually they occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD "" followed by NEWLINE; then increase the volume of the recorder slowly with the tape running until the television screen shows four or five thick black bands. If you then re-wind the tape, the program should LOAD normally.

LOADing and SAVEing on the Spectrum is much easier and faster than the ZX-81. One difference is that when SAVEing on the Spectrum the LOAD lead must be disconnected either at the recorder or the Spectrum.

Finally, a health warning. Apart from any practical uses, computing with your Sinclair machine can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning thinking that in another five minutes you will solve the problem. Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a Sinclair computer you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

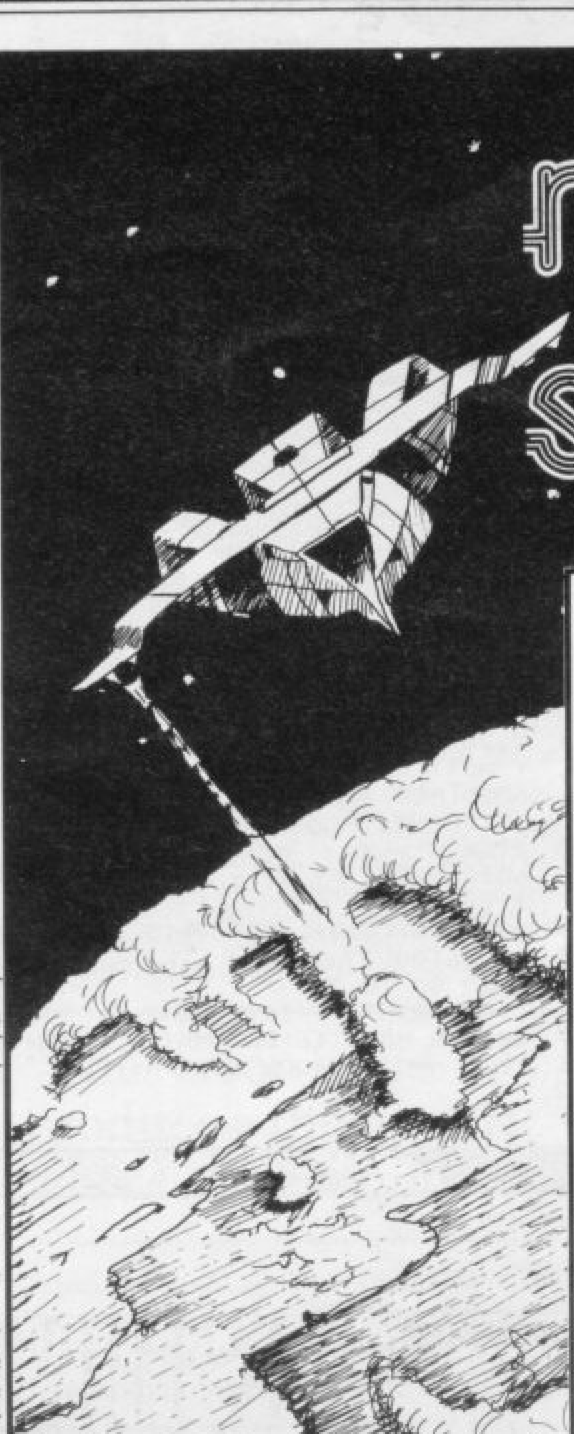
Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours.

MATHS TEST

SHARPEN your mental arithmetic with **Maths Test** for the 1K ZX-81 by David Steel of Beith, Ayrshire. The program will ask you to do a number of sums, telling you the correct answer if you are wrong.

The graphics at lines 50 and 60 print a large question mark on the screen. Notice also that at line 100 the random numbers chosen by the computer for the sums must be printed as whole numbers by using the INT function. If you want to change the sums to subtraction or other operations, change the plus sign in lines 100 and 105 to the appropriate symbol.

```
  10 CLS
  50 PRINT AT 4,20;"▀▀";AT 5,19;
"█ █";AT 6,21;"▞"
  60 PRINT AT 7,20;"█";AT 8,20;"
█";AT 9,20;"▖"
  80 PRINT AT 4,1;"QUESTION: "
  90 LET A=RND*375
  91 LET B=RND*159
 100 PRINT AT 20,0;INT A;"+";INT
 B
 105 LET D=INT A+INT B
 110 FOR F=1 TO 250
 111 IF INKEY$<>"" THEN GOTO 200
 112 NEXT F
 130 PRINT AT 15,10;"TIME UP"
 140 GOTO 222
 200 PRINT AT 20,0;"          "
 205 INPUT A
 210 IF A=D THEN PRINT AT 15,10;
"CORRECT"
 220 IF A<>D THEN PRINT AT 15,10
;"TWIT,WRONG"
 222 PRINT AT 20,20;"ANSWER=";D
 225 PAUSE 300
 230 GOTO 1
```



missile strike

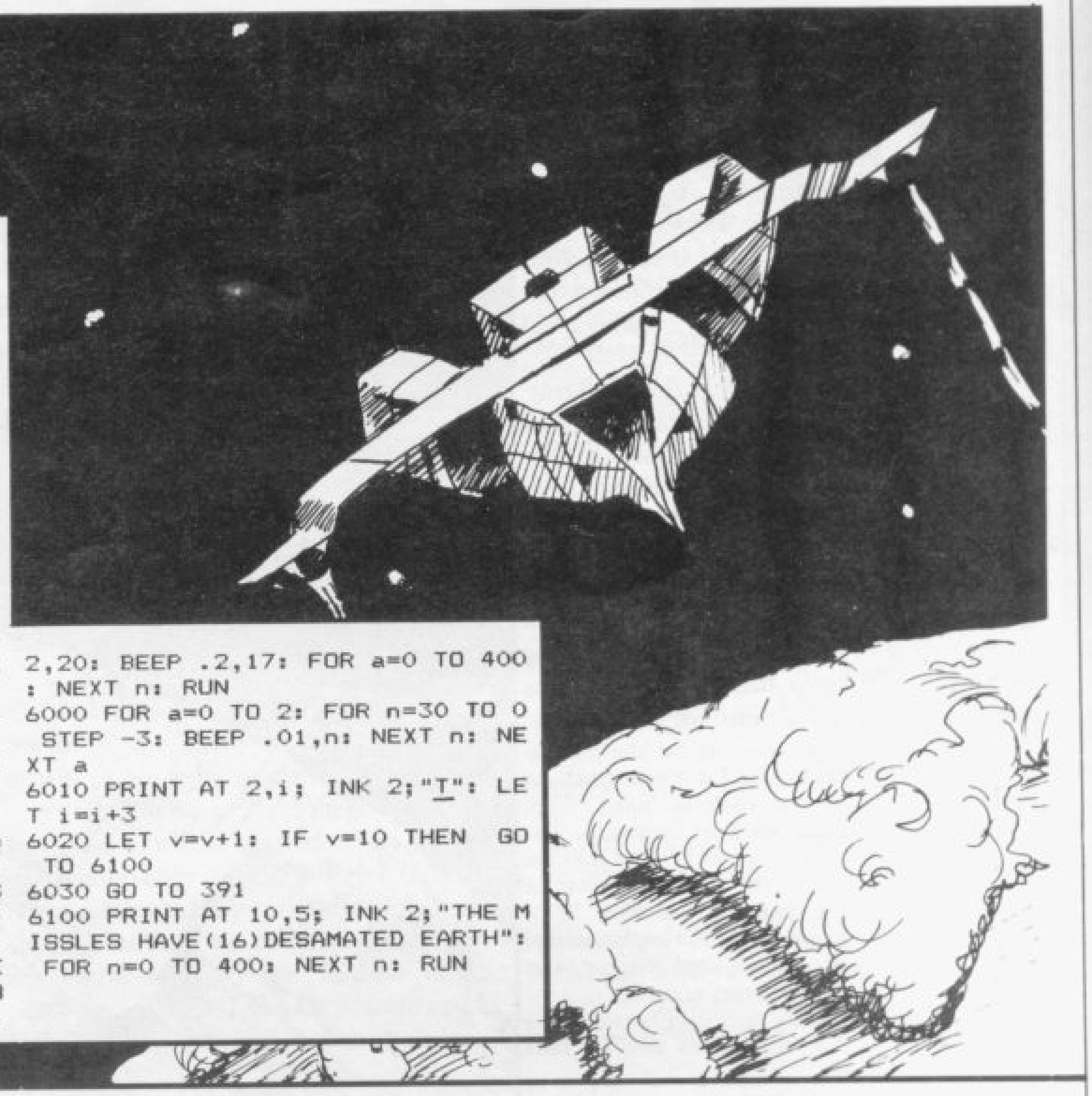
MARK YOUNG of Hull wrote **Missile Strike,** a simple arcade game for any Spectrum. You must use cursor keys 1 and 2 to move your spaceship and 0 to fire your laser in an attempt to shoot down the missiles threatening the existence of Earth.

The game uses special graphics characters and you should turn to the first page of the Program Printout section to discover how to enter them correctly. Take particular care with the underlined letter T. It is not an ordinary capital T but is obtained by pressing key t while in graphics mode. The underline will not appear in your listing — it is our method of showing that the letter is a user-defined graphics character and not an ordinary letter.

Lines 1-9	Read the data for the user-defined graphics. The data is held in line 1040 in binary form, using the BIN command. The information is POKEd into the eight bytes where the layout of the graphics character T is stored. For a full explanation of the process, read chapter 14 of the Spectrum manual.
Lines 10-24	Mainly decorative but also set a few variables to zero for later use.
Lines 25-80	Print instructions for the game if requested.
Lines 90-280	Print the basic screen for the game.
Lines 290-310	Set the initial co-ordinates for your spaceship, which will be represented by the letter D. The co-ordinates are set both for character squares and for the single pixels, so that your laser fire can be drawn at the proper place.
Lines 394-396	Set up the position for the enemy at random.
Lines 400-402	Print your spaceship and get ready to print the laser fire.
Lines 405-425	Adjust the co-ordinates according to which key you press.
Lines 439-445	Variable u holds the length of your laser fire. The other lines draw it depending on the position of your ship.
Line 460	If p is less than three you have failed to stop the missile.
Line 470	Removes the previously printed missile in preparation to printing it again elsewhere.
Line 480	You missed the missile but have another chance to hit it.
Line 490	A new missile is required.
Line 1040	The DATA statement for the user-defined graphics.
Lines 4095-4098	You have destroyed a missile, so the program prints a crude explosion and makes a noise.
Lines 5000-5020	Line 5000 makes more noise. Line 5010 and 5015 add to your score and count the number of missiles in w. If you have destroyed 10 missiles you win, otherwise the program returns to 391 for a new missile.
Line 5100	Having destroyed 10 missiles you are congratulated and the program plays a tune. Following that, the program will RUN again.
Lines 6000-6030	A missile has got through to earth. Variable v holds the number of failures and if there are more than 10 you lose.
Line 6100	You have lost the game and a message is printed. The program will then RUN again.

```
   1 FOR N=0 TO 7
   2 READ data
   8 POKE USR "T"+n,data
   9 NEXT n
  10 LET w=0: LET v=0
  15 BORDER 0: PAPER 0: INK 3: C
LS
  20 LET i=1: LET q=1
  21 FOR a=1 TO 31
  22 PRINT "T";
  23 PAUSE 3
  24 PRINT CHR$ 8;"(sp)";: NEXT
a
  25 PRINT AT 1,9; FLASH 1;"Inst
ructions?";AT 3,9;"press any key
"
  30 LET b$=INKEY$: IF b$="(sp)"
 THEN  GO TO 30
  40 IF b$="n" THEN  GO TO 90
  50 BORDER 0: PAPER 0: INK 7
  60 PRINT AT 19,0; INK 6;"defen
d earth from the invading(7*sp)m
issles  which are(10*sp)penatrat
ing the atmosphere ";AT 8,3; FLA
SH 1;"1(12)=(11*sp)up";AT 10,3;"
2(12*sp)=(11*sp)down";AT 12,3;"0
(12*sp)=(11*sp)fire"
  70 FOR N=-40 TO 30: BEEP 0.1,N
: BEEP 0.01,N-10: NEXT N
  80 CLS
  90 BORDER 0: PAPER 0: INK 7: C
LS
 100 PRINT AT 3,0; INK 2;"******
**************************";AT 1
6,0; INK 6;"********************
************"
 110 PRINT AT 0,0; INK 2;"HITS A
GAINST";AT 19,0; INK 6;" SCORE"
 280 BORDER 0: PAPER 0: INK 7
 290 LET x=10: LET y=0: LET z=0
 310 LET a=8: LET b=92: LET c=10
0
 394 LET e=INT (RND*11)+4
 396 FOR p=INT (RND*20)+10 TO 0
STEP -1
 400 PRINT AT x,y;"D": BEEP .000
1,0: PRINT AT x,y;"(sp)"
 402 PLOT a,b: PLOT  INVERSE 1;a
,b
 405 LET a$=INKEY$
 410 IF a$="1" AND x>4 THEN  LET
 x=x-1
 415 IF a$="1" AND b<136 THEN  L
ET b=b+8
 420 IF a$="2" AND x<17 THEN  LE
T x=x+1
 425 IF a$="2" AND b>36 THEN  LE
T b=b-8
 439 LET u=150
 440 IF a$="0" THEN  DRAW a+u,0:
 PLOT a,b: DRAW  INVERSE 1;a+u,0
 445 IF e=x AND a$="0" THEN  GO
TO 4095
```

continued on page 104

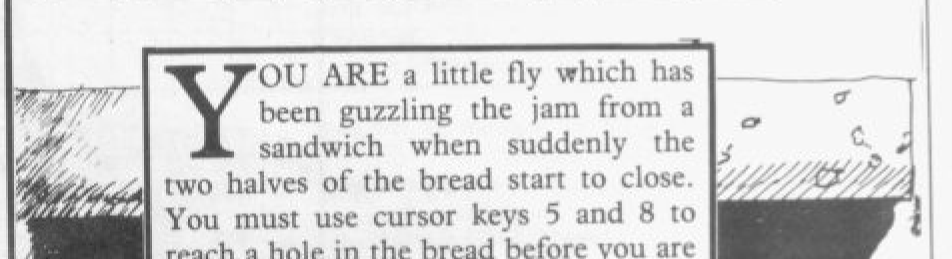


```
460 IF p<=3 THEN  GO TO 6000
470 PRINT AT e,p; INK 4;"T": BE
EP .01,0001.05: PRINT AT e,p;"(S
P)"
480 NEXT p
490 GO TO 391
1040 DATA BIN 0000000,BIN 00000
001,BIN 0011110,BIN 1111111,BIN
 0011110,BIN 0000001,BIN 000000
00,BIN 0000000
4095 PRINT AT e,p; PAPER 0;" ":
FOR n=7 TO 0 STEP -1
4097 PRINT AT e,p; INK 3;"(ig8)"
: BEEP .02,n-12: PRINT AT e,p;"(
sp)"
4098 NEXT n
5000 FOR a=0 TO 5: FOR n=0 TO 30
 STEP 6: BEEP .01,n: NEXT n: NEX
T a
5010 PRINT AT 21,q; INK 6;"T": L
ET q=q+3
5015 LET w=w+1: IF w=10 THEN  GO
 TO 5100
5020 GO TO 391
5100 PRINT AT 10,5; INK 6;"the m
issles have been(SP15)destroyed"
: PAUSE 100: PRINT AT 14,0; FLAS
H 1;"*******WELL DONE!!!*******"
: BEEP .1,20: BEEP .1,17: BEEP .
2,13: BEEP .2,13: BEEP .1,13: BE
EP .1,15: BEEP .1,17: BEEP .1,18
: BEEP .2,20: BEEP .2,20: BEEP .
2,20: BEEP .2,17: FOR a=0 TO 400
: NEXT n: RUN
6000 FOR a=0 TO 2: FOR n=30 TO 0
 STEP -3: BEEP .01,n: NEXT n: NE
XT a
6010 PRINT AT 2,i; INK 2;"T": LE
T i=i+3
6020 LET v=v+1: IF v=10 THEN  GO
 TO 6100
6030 GO TO 391
6100 PRINT AT 10,5; INK 2;"THE M
ISSLES HAVE(16)DESAMATED EARTH":
 FOR n=0 TO 400: NEXT n: RUN
```

SANDWICH

YOU ARE a little fly which has been guzzling the jam from a sandwich when suddenly the two halves of the bread start to close. You must use cursor keys 5 and 8 to reach a hole in the bread before you are crushed to death.

The game runs on the ZX-81 in 1K and was written by Erik Smit of Leidschendam in the Netherlands.



```
  5 LET A$="████████████████████"
  6 LET F=6
  7 LET O=0
  8 LET R=0
  9 LET Y=0
 10 LET A=21
 11 LET B=INT (RND*15)
 12 LET Y=Y+1
 13 LET A=A-1
 14 CLS
 15 PRINT AT Y,0;A$;AT A,0;A$
 16 PRINT AT Y,B;"  "
 17 PRINT AT A,B;"  "
 18 LET F=F-(INKEY$="5" AND F>0
)+(INKEY$="8" AND F<15)
 19 PRINT AT 11,F;
 21 LET N=PEEK 16398+256*PEEK 1
6399
 23 LET N=PEEK N
 25 PRINT "*"
 27 IF N=128 THEN GOTO 100
 50 IF A=0 OR Y=21 THEN GOTO 80
 60 IF R<10 THEN GOTO 12
 70 GOTO 110
 80 LET O=O+1
 82 LET R=R+1
 84 GOTO 9
100 LET O=O-1
105 IF R<10 THEN GOTO 12
110 PRINT ,"SCORE ";O
```

Trapping the errors will ensure first-time running

THE FIRST error code encountered by most Sinclair users is the flashing "S" on the ZX-81 or "?" on the Spectrum, which indicates a syntax error in a sentence. Experience and the manual soon show that it is caused usually by typing-in a keyword letter by letter, or by bad punctuation, for example omitting a semi-colon or an inverted comma.

The most frequently-occurring error code is "2" — variable not found. A variable is a letter which has been given a numeric value. When you enter "LET a=2" you are defining a variable. Error code 2 results when the computer reaches a variable in the program to which you have so far given no value.

Check the line which the computer specifies. If it is your program, give a value to the variable or remove it. If you are copying the program, look back in the listing to see which line you have missed.

Although the majority of error codes are explained adequately in the manuals, the report "B-Integer out of range" can be confusing. An integer is a whole number — 1 is an integer, 1.5 and 1½ are not. That code occurs most frequently when you try to print something beyond the limits of the screen.

PRINT AT 0,31; "a" is acceptable and will print a letter "a" at the top right of the screen. PRINT AT 0,32; "a" would not be possible. The integer 32 would be out of range, resulting in error code "B". That would also happen if the computer were instructed to PRINT AT 0,31;"ab". It would still be trying to print a character beyond the limits of the screen.

That error is more difficult to detect if variables have been used as co-ordinates and your character, or series of characters, is being printed in varying positions. If the instruction PRINT AT 0,x;"a" produces report code B, make sure that the value of x never increases beyond 31.

On the Spectrum "B-integer out of range" is also often found when you are POKEing-in user defined graphics. The biggest number which can be POKEd-in this case is 255 or BIN 11111111. In that case the error code will occur in the line containing the POKE statement. In most cases, though, the error will have occurred in one of the DATA lines in the program.

A very frequent error code produced on the Spectrum is "E-Out Of Data". That will occur in a line containing a READ statement. The error code, though, will have occurred in one of the program DATA lines, which may be nowhere near the READ line. A READ command sends the computer to a DATA line to collect the next piece of DATA contained there. That is often done using a FOR, NEXT loop, especially when graphics are being set up.

FOR n=1 TO 8: READ n will send the computer to the DATA lines eight times, for eight separate pieces of information. If there are only seven pieces of DATA there it will return to the READ line and produce the code OUT OF DATA. When there are several DATA lines they will all have to be checked, because the piece of DATA you have omitted was not necessarily the last.

In some cases the computer will follow the program correctly, without producing an error code, but from the programmer's point of view the program contains an error. In that case BREAK into the program at the moment it goes wrong. That will produce report code 9 and the line on which you have STOPped the program. That method makes it easy to locate the area of the program which contains the error.

Programs which you copy from magazines, books or from friends can be difficult to error-trap because they contain programming techniques which you have not yet learned, or simply because it is often difficult to follow another programmer's logic.

The flashing "S" or "?" indicating a syntax error may appear frequently. In that case check carefully what you have copied. You may not have recognised words such as LN or EXP as keywords.

On the ZX-81 especially it is easy to forget that pressing "π" will produce the word PI.

Make sure that when the "is not equal" sign, "< >" appears in a listing you always enter it as one character and not as "is less than", "<" followed by "is greater than", ">".

Technical problems can also cause errors in programs. Any alteration to the power supply can cause a program to CRASH. In that case the screen display may change dramatically and using the keyboard will have no effect. The only solution is to unplug your computer and begin again, making sure that your power supply and RAM pack are both connected firmly. That error is caused by the computer and not by the program.

> 'The error need not be on the line which produces the report; that is simply the line where the computer meets the problem'

Sometimes a program listing in a book or magazine will contain what seems to be a very obvious error. If it contains key words or symbols which are not on your computer, check that it is intended for your machine. Programs for the Spectrum, the ZX-81 and the ZX-80 are not usually directly interchangeable. If a program contains the command GOTO or GOSUB — a non-existent line number — the computer will simply go to the next numbered line after that one. That is a sign that a program has been developed and improved and is rarely an error.

When you have errors in a program, first check the report codes listed in Appendix B of the manual. It may then be necessary to read the appropriate section of the manual. Remember that the error is not necessarily on the line which produces the report code; that is simply the line where the computer meets the problem for the first time.

Always check carefully every line connected with the line containing the error code and the mistake should be easy to locate.


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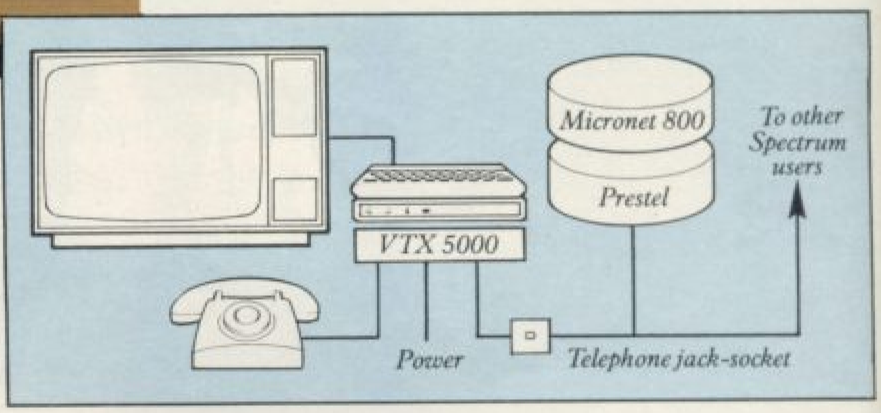




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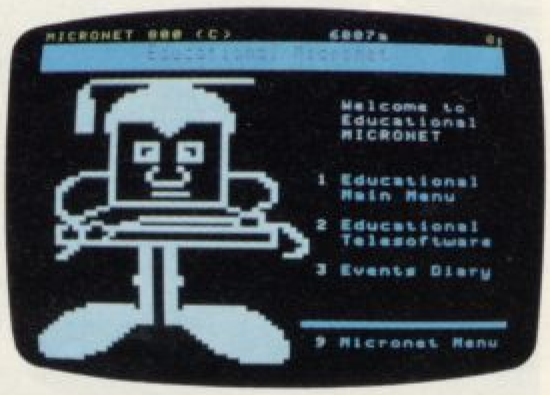
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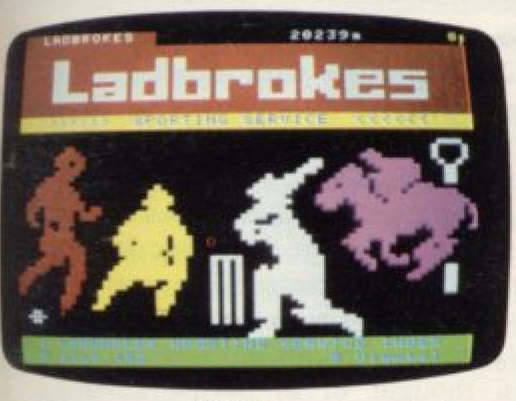
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The games people play



Does *Manic Miner* improve your cognitive development? Joe Palca finds out

CONTRARY to what you may have heard, computer games are not a waste of time. That at least is the opinion of Dr Michael Anderson, a researcher at the MRC Cognitive Development Unit in London. He believes that computer games require new types of thinking. Moreover, he sees them as a potential learning tool, one which may open doors for children who cannot be reached by more conventional educational techniques.

Anderson certainly does not fit the stereotype of the stuffy academic. He has a full red beard to go with his somewhat shaggy red hair and, in place of a white laboratory coat, he wears a button-down shirt and jeans. His broad Scots accent immediately indicates he does not hail from London.

Some of his ideas set him apart from the majority of educators and academics. He believes that people under-estimate how much thinking is required to play a computer game successfully.

"Computer games may look just like fun, but there is an important amount of real learning which goes on in them", Anderson says. "What I am interested in is the kind of learning that is possible within that framework".

Anderson is trying to study what goes through a game player's mind during a game — what a psychologist would call the cognitive strategies a player uses. He has begun experimenting with how people learn to become good at computer games.

"We are using the Spectrum for two main reasons. One is that we are interested in the computer game format to investigate cognitive development. The thing about the Spectrum is that there is plenty of software available for it. As anybody who knows anything about computers finds, writing games software is tricky.

"The second reason is that we will probably be taking our equipment into schools. The Spectrum is small and portable but it is also powerful."

Anderson began his career in psychology at Edinburgh, studying intelligence. "I was interested in individual differences in intelligence — why somebody is cleverer than somebody else," he says.

For his graduate degree Anderson moved to Oxford where he became interested in learning. There he met his first computer, a Digitial Equipment PDP/BE, and wrote his first program for that machine, a simple paddle and ball game.

At Oxford, Anderson became interested in an area of psychology known as perceptual motor learning. At the simplest level, it is a type of learning a baby does as it starts to reach out and touch things in the world around it. On a more complex level, perceptual motor learning is required by a surgeon, who must learn to move his arm extremely accurately while holding a scalpel, or by a footballer who moves his body into position to head a centre into the goal.

Even a seemingly simple task like answering the telephone requires a good deal of perceptual motor learning. If you do not believe that, try writing a computer program which will be able to detect the ring, see the telephone on a desk, and then guide an arm to pick up the receiver. Despite that complexity, that type of learning has been somewhat ignored by psychologists.

"I started looking at how people improved at perceptual motor tasks — how did they improve with practice?", Anderson says. "I found there is a larger cognitive component than had been thought previously. In other words, people improve at those types of tasks because they change what they do, rather than become more efficient at what they always had been doing.

"Perceptual motor learning has never been thought of as having anything much to do with intelligence. Conventional wisdom may hold that you do not have to be very bright to be a good footballer but I do not think that is true."

Anderson is a soccer player, a midfielder in a six-a-side team, and recently he went to Mont St Michel for a tournament. "I suppose football is my other great obsession in life."

In his office hangs an autographed picture of Kenny Dalglish. "He's my hero", declares Anderson, "though he is getting a bit old."

Next door to his office, a small room contains the computers Anderson uses. Besides the Spectrum there is a Micro-



Dr Michael Anderson

tek VUB, a terminal connected to the university mainframe, and three Sirius computers, the newest of which contains a 10MB hard disc.

To begin his research projects, Anderson is using a standard Spectrum, with a cassette drive for program loading. He uses an Atari joystick with an AGF interface. The interface permits him to standardise the way the games are controlled.

Sitting in front of the Spectrum, Anderson begins to load **Manic Miner** so that he can demonstrate some of the concepts he is studying. The joystick is bolted to the table on which the computer stands, giving him a sturdy base from which to work.

The Central Cavern appears on the screen. "The first time you see the ledges, they look solid, and you think you cannot jump through them but, of course, sometimes you can. You do not try certain strategies because you know things about the world you assume are true for the game. The game compels you to develop alternate ways of dealing with problems. When you start you bring world knowledge to bear on Manic Miner. Later, you bring Manic Miner knowledge to Manic Miner."

Anderson works his way quickly through the first few screens. "The Cold Room is dead easy. I suspect they put an easy screen near the start to keep you going", he says.

By the time he reaches Eugene's Lair, Anderson is concentrating harder on the game. "The thing about Manic Miner is that there is more than one solution. My boss spent ages on this screen. He finally found all the keys and then Eugene came down to block the exit. It was a crushing blow for him. He got it, though, and now spends his time finding more interesting ways of getting through".

Arriving at the Wacky Amoebatrons, Anderson explains that patience is an important element in the game. "Like the Processing Plant, you have to wait for your chances. I tend to panic".

At the Attack of the Mutant Telephones, idle chatter ceases. "This is as far as I've got . . . this is murder . . it collapses . . . I forget . . . Oh, noooo." He's not going any further on this day.

Although his research project is just starting, Anderson has already had a chance to sample a fair number of the most popular Sinclair games. For the time being, however, his favourite is Manic Miner.

Anderson is hoping to turn the addictive nature of the games to an advantage. "For a large proportion of the population, especially children, computer games are highly motivating. Children like to play them. School, on the other hand, does not generate the same enthusiasm. We are trying to produce educational software which will contain some of the motivational aspects of the computer games so that children like to learn."

Anderson's primary goal is to understand the types of skills different computer games require. Before he tries to develop games to promote learning or encourage participation, he wants to know more about how much of those qualities exist in available games.

"I am planning to look at a number of games to try to find what features are important for such variables as interest, excitement, boredom, frustration and so on. I am trying to distill some of the motivational properties of the games."

Anderson plans to use all types of people in his initial experiments. "We shall run the initial studies not only on normal people and children of various ages but also on special groups — children with Down's syndrome, autistics, and so on, to see how they classify the games".

Part of the function of the MRC cognititive development unit is to provide microprocessor-based aids for the handicapped, in particular learning aids.

"If you are so paralysed that all you can do is move your eyes, you may have a perfectly well-functioning brain, but because you have so little control over your environment you may never be able to express that. When you can hook eye movements to a computer system, eye movements suddenly become very powerful. The computer becomes an interface to the world", he says.

With Warwick Smith, the unit hardware specialist, Anderson has already helped design a computer game which can be controlled by tensing a muscle. Input from the electrical activities in the muscles is fed through an A/D converter into a microprocessor and the muscle signals control the position of the cursor moving through a maze. The system is being used by a physical therapist to encourage injured or disabled children to exercise muscles which would atrophy if they are not used.

Ultimately, Anderson expects to move away from the Sinclair for his experiments, switching to his own system. His plan is to put the games software into a ROM chip and have another on-board ROM for storing the responses his subjects will make. That information will be dumped into a Sirius microcomputer for analysis.

For now, the Spectrum and Manic Miner are occupying much of his time. After all, he still has eight more screens to figure out.

Photograph: Max Bradley

It takes a long time to take subjects into the laboratory to study them, so Anderson is looking to Sinclair users for some help. If you are an 'expert' games player, or even if you play only from time to time, he would like to hear from you. If you send him a postcard, he will send you a stamped return envelope and a questionnaire.

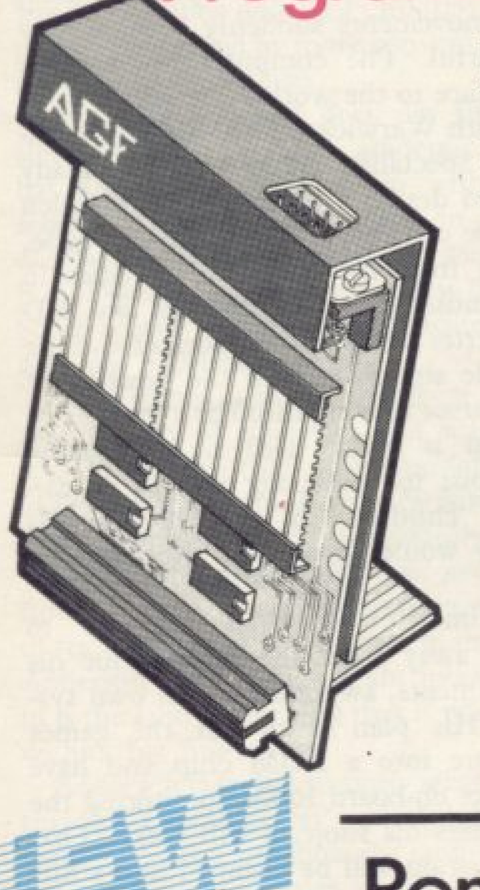
The results of the questionnaire will be used to classify some of the more popular computer games into the categories Anderson is planning to study. Write to: Michael Anderson, Cognitive Development Unit, 17 Gordon Street, London WC1H 0AH.

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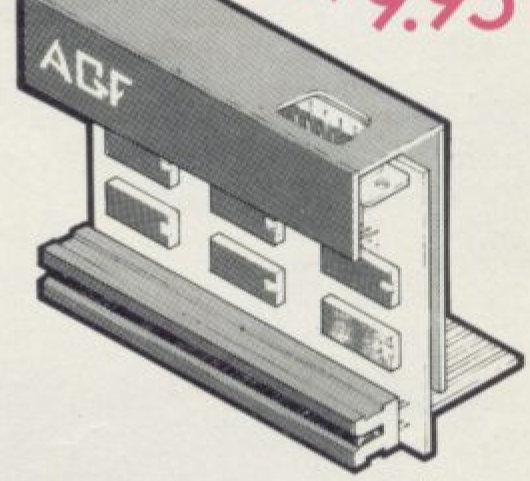
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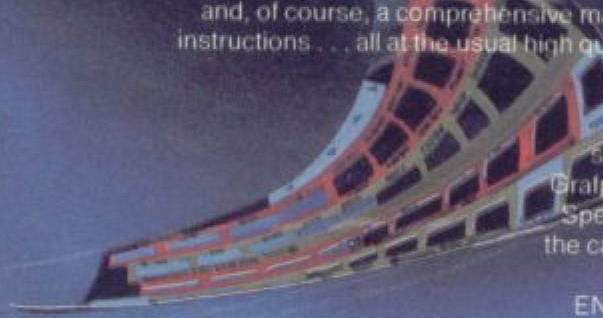
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Beaky would normally assume this role without a second thought, however he had his own problems to face for the dreaded Eggsnatchers had returned to threaten the very existence of his breed. Beaky's survival instincts do not allow him to leave Crackit until he has reared enough chicks to fight off the Eggsnatchers. In order to crack it, he must pass through 12 different stages each getting progressively harder.
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The incredible Hulk fails to move Quentin Heath

The jolly green giant is here

The release of **The Hulk,** for the 48K Spectrum, marks the culmination of several months of collaborative effort between Marvel Comics and Scott Adam's UK company Adventure International.

The graphics adventure, which has a screen format almost identical to that of **The Hobbit,** features Marvel superheroes and villains such as The Hulk, Dr Strange and The Chief Examiner. It is Marvel's first venture into the world of microcomputer software and it is doubtful whether it would have made an entry if publisher Stan Lee and Scott Adams had not formed a team dedicated to producing a series of games based on comic characters.

Both men have been innovators in their heydays. Lee almost single-handedly created the comic market in Britain and created many of the Marvel heroes. Scott Adams is the man who invented the microcomputer-based adventure game. He was behind the first commercial adventure to be launched, **Adventureland,** and has most of the responsibility for bringing The Hulk to the small computer screen. The game uses the classic Adams textual style, which he took from the larger mainframe adventures, combined with graphics which are drawn at a speed which rivals The Hobbit.

The graphics routines may be innovative but the text translator routines which decode the player's instructions to the computer are simplistic and crude. They allow only the use of a verb and noun structure which means only one instruction at a time can be typed into the machine and all commands must conform to the same format.

The program will only understand words which are relevant to a particular location and will ignore all others, sending an error message to the player with apologies for its ignorance. That puts user-friendliness right out of the window and makes the player feel as though the game was written in the stone age of computing.

If Adams had been limited for memory space within the program he should have put to one side the detailed pictures which emulate The Hobbit and instead worked on the translator so that it could handle multiple phrases within sentences coupled by conjunctions. Such techniques might have been innovative six or seven years ago, when Adams first started writing games, but in the British market today they are old hat.

The story involves Dr David Banner and his alter-ego The Hulk in a quest to find the Bio-Gem, an orb of energy with fantastic powers. While trying to accomplish his quest Banner must collect several ordinary gems. Finding and placing the gems is the main method of scoring in The Hulk and you are not given a logical reason for so doing. The same is true of the character motivation within the game. Unlike many of the classic adventures, created by such companies as Level Nine Computing and Digital Fantasia, the characters within The Hulk are not given any motivation apart from an allegiance with either good or evil.

The total lack of character realisation produces cardboard cutouts which you will not find even in the comic books. In those publications the heroes try to lead ordinary lives, such as Peter Parker who as well as being Spiderman also leads a more mundane life as a newspaper photographer. In the comics characters worry about money, the level of crime in society and even where their next meal is coming from.

The Hulk adventure, however, takes none of those factors into the storyline and so the player tends not to feel any attachment to hero or villain. The Hulk would have been an excellent opportunity for Stan Lee's brand of superhuman drama.

HINTS AND TIPS

Becoming the Hulk can be a biting problem.
The Chief Examiner will tell you where you are.
The power of the egg can destroy all but The Hulk.
Take Strange at his word.

While the characters are uninteresting the plot is too inventive. The authors have taken great leaps and expected the player to follow. For instance, The Hulk creature is an integral part of the adventure and helps Banner to get out of most of the tight spots. The player, however, will either have to be clairvoyant or pay attention to all the examples in the instruction booklet to find the one way in which Banner can turn into this alter-ego.

If you are a gamer who does not want to look at the help sheets supplied with the game to solve the adventure then you are likely to be disappointed with The Hulk, unless you have a power of deduction which borders on ESP.

Most adventure writers leave 'plants', or objects which aid understanding, at every location. Adams does not bother with that and you move suddenly from open fields to an underground enclosure without entering a dome or going through a tunnel. Any map-making techniques, which have been started when the player is transported, will become useless and a new strategy will have to be formed.

Adams seems to be in a time warp. He is still writing for the 1970s and does not seem to be aware of the latest advances in adventure writing techniques.

The Hulk will sell but not because of its technical excellence. Marvel has put so much commercial hype behind the product that anyone enticed by superheroes will buy it. That is a pity as there is too much hype in the market already and the new Marvel adventures only add to it.



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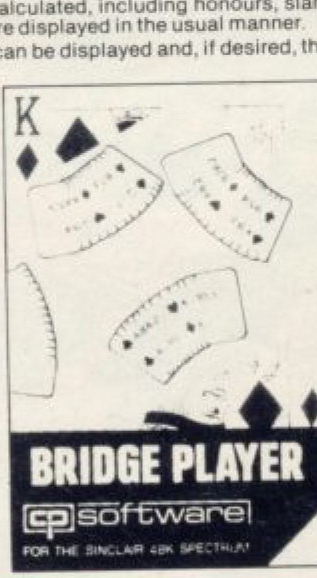
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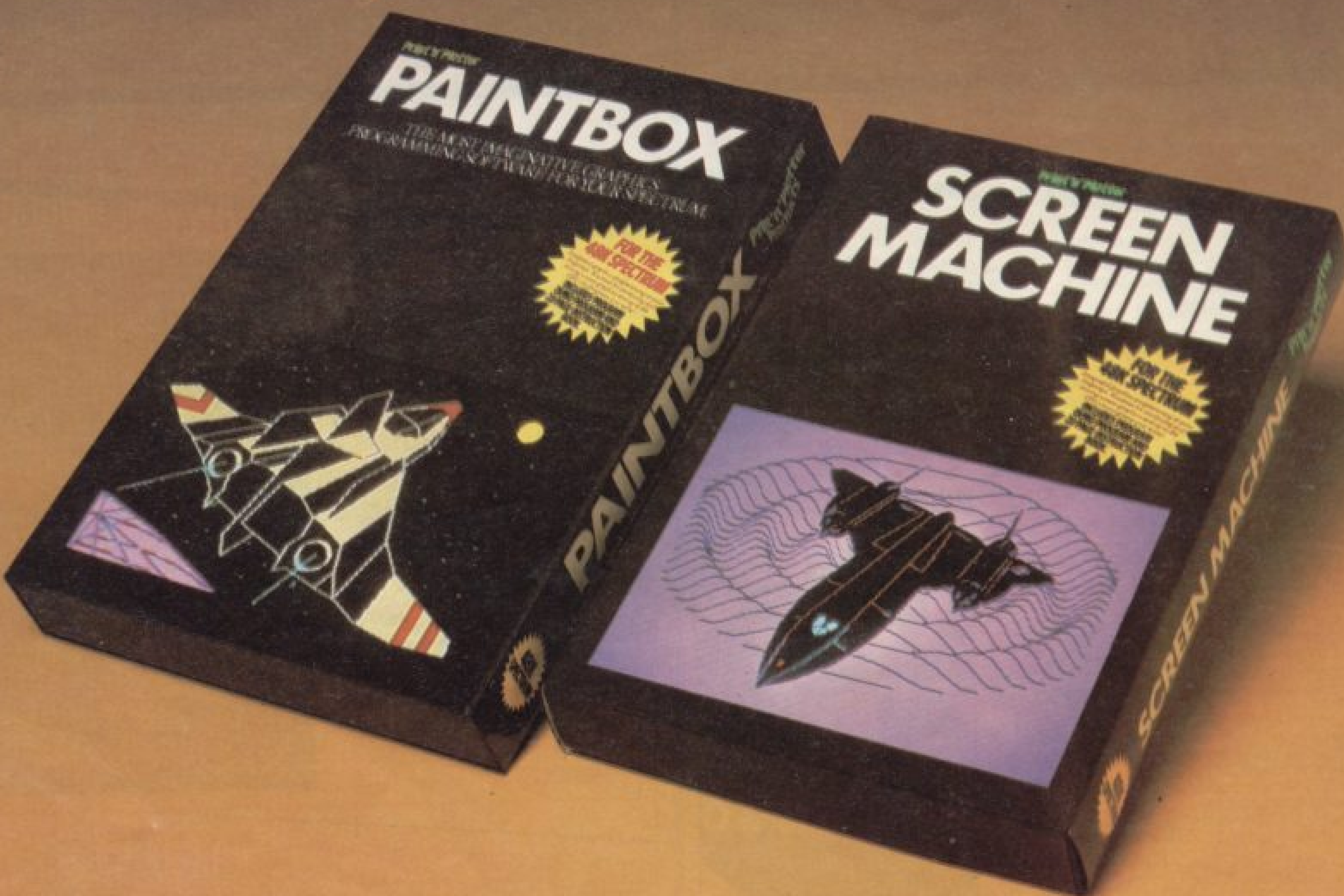
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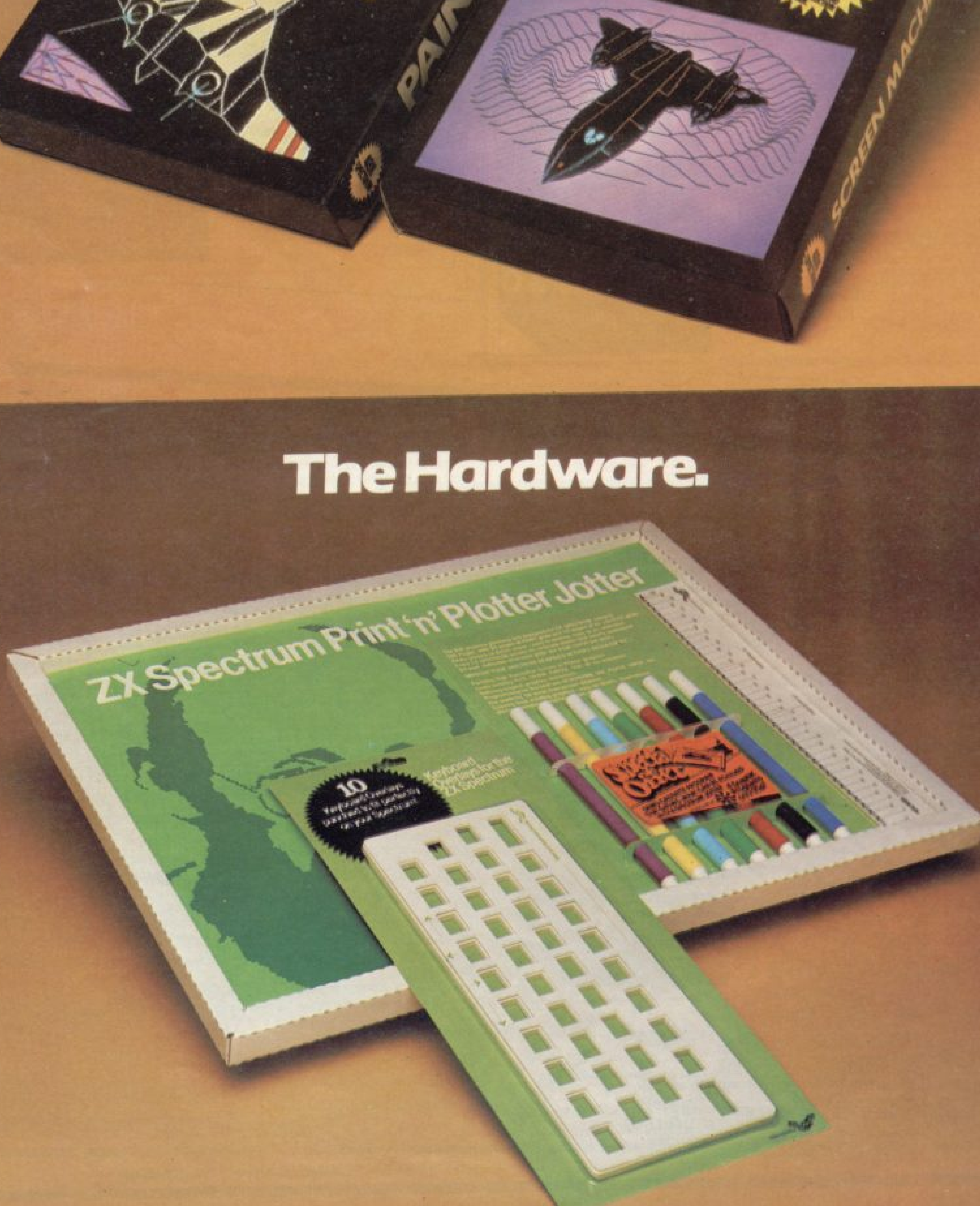
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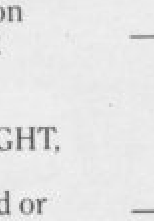
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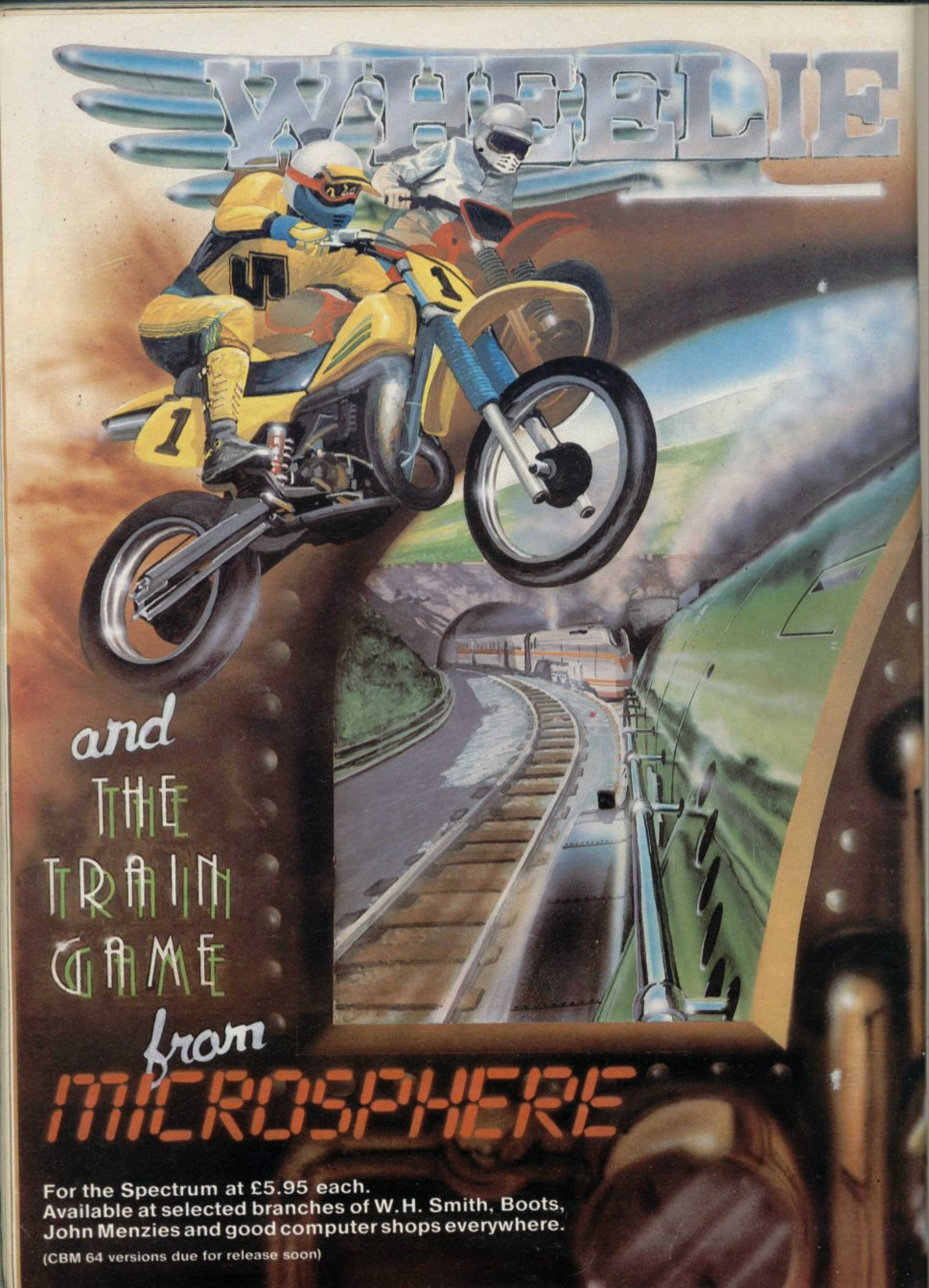
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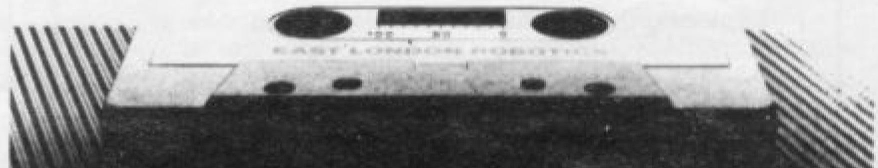
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EAST LONDON ROBOTICS

Control your characters

Andrew Hewson reveals some useful tips for programming graphics

EACH MONTH I try to vary the contents of this column; sometimes I tackle a single difficult topic in detail, sometimes I cover several related topics and sometimes I discuss a mixed bag of ideas. The column this month belongs firmly in the final category.

The first letter is from John Lockerby of Canterbury who writes: **I am repeatedly faced with the "Nonsense in Basic" error when writing programs for my Spectrum. It always occurs when I try to READ from DATA statements. What am I doing wrong?**

Appendix B of the Spectrum Basic Programming Manual states that error code C — Nonsense in Basic — occurs with the VAL and VAL$ functions, not with the DATA or READ commands, so it is easy to understand John's confusion. In fact neither the error message nor the explanation in the manual are as clear as they might be.

A few moments spent experimenting with the VAL and VAL$ functions will show that error code C occurs when the string on which the function operates cannot be evaluated; for example, the VAL function evaluates a string as a numerical expression so that

VAL "5+2"=7

whereas both

VAL"5+*2" and VAL "a$"

give error code C because in each case the expression within the quotes breaks the rules which govern the form of numeric expressions. Hence the ROM routine which is responsible for evaluating the expression gives up in disgust and triggers the printing of the error message.

The program in table one shows an example of that type of situation. Both



• *Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.*

of the DATA statements in lines 10 and 20 can be READ by the loop in lines 100 to 130 depending on the line number, J, selected by the user. If line 10 is selected the program reads each of the four characters in turn into the string variable A$ and then PRINTs it. If line 20 is selected, however, error C occurs because the program attempts to read a numeric item into the string.

Peter Groenewald asks: **Is there a poke command for the 16K Spectrum which causes the cursor to change from upper to lower case?**

That is not possible, unfortunately, because the letter representing the cursor — either K, L, C, E or G depending on the mode in which the machine is operating — is determined indirectly from the MODE system variable which is held at address 23617. The value of MODE is read by the cursor printing subroutine at address 6369 in the Spectrum ROM and it then passes the appropriate character code — either 75, 76, 67, 69 or 71 — to the main printing routine at 2548. The contents of the ROM cannot be changed and so it is impossible to change the character codes. It is, of course, possible to copy the ROM routine into RAM and modify it but it is not possible to return the modified copy to ROM.

A possible solution is to change the character set which the PRINT routine uses by altering the system variable called CHARS held at address 23606. CHARS points to the base of the table which controls the form of each character. Changing that variable alters the form of the entire character set and it must, of course, be changed back again after use otherwise all subsequent characters PRINTed will be incorrect.

John Edwards of Derby would like to make use of the facility to change the character set. He asks: **Is it possible to print characters which are underlined?**

The answer is to copy the original character set from ROM to RAM, modify it so that characters will be generated with an underline and then alter CHARS to point to the base of the new table. The program listed in table two demonstrates the method.

The first line in the program brings RAMTOP down to 32767 so that the new character table which will be stored above that address will not be overwritten by the Basic system. Next, the character table in the ROM is copied byte by byte to its new location. Only the characters with codes lying between 32 and 127 are derived directly from that table — all the remainder consist of tokens or control codes. Each character requires eight bytes to define it so that the entire table is 768 bytes long.

The eight bytes which determine each character do so in horizontal slices so that to underline a character fully it is necessary to set all the bits in the final byte to 1. In other words the final byte must be set to 255. That will cause a

continued on page 127

```
10   DATA "A", "B", "C", "D"
20   DATA 1, 2, 3, 4
50   INPUT " ENTER NUMBER OF DATA LINE "; J
60   GO TO 50 + 20 * (J = 10) + 20 * (J = 20)
70   RESTORE J
100  FOR I = 1 TO 4
110  READ A$
120  PRINT A$
130  NEXT I
```

Table 1. To demonstrate that error code C can occur at run-time when there is a mismatch between the contents of DATA and READ statements. The program executes correctly if DATA line 10 is selected but fails if DATA line 20 is selected.

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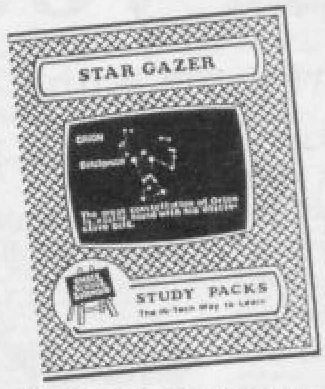
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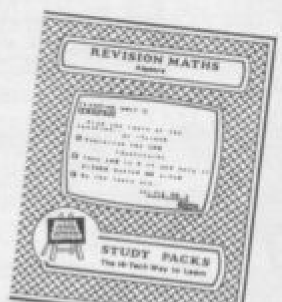
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continued from page 125

continuous line to appear beneath a line of PRINTed characters. I prefer a broken line so I have used the value 127 in the program to ensure the first and last bits are not set. I have also avoided underlining the space character, which happens to be the first character in the set, by starting the loop at address 32783 rather than 32775.

The final line of the program resets the CHARS variable. Incidentally, the initial value is 60 and in order to recover the original character set it is necessary to enter POKE 23607 , 60.

```
10   CLEAR 32767
100  FOR  I  =  0 TO 767
110  POKE  32768 + I , PEEK ( 15616 + I )
120  NEXT  I
200  FOR  I  =  0 TO 94
210  POKE  32783 + 8 * I , 127
220  NEXT  I
230  POKE  23607 , 127
```

Table 2. A program to copy the character set into RAM, underline all characters except space and point the CHARS system variable to the new character set.

Owners of the 16K Spectrum will have to lower RAMTOP to a smaller value, such as 31743, and change the value POKEd into CHARS appropriately. The relationship between RAMTOP and this value is:

Value POKEd into 23607 = INT ((RAMTOP + 1)/256) − 1

Valued POKEd into 23606 = RAMTOP − 255 − 256* (Value POKEd into 23607)

Note that the method does not alter the user defined graphics which are set to a copy of the capital letters A to U when the machine is switched on.

Michael Gwynne of Farnham writes:

I notice that some commercial Basic programs include lines that are flashing or in colour. How are these effects produced?

The Spectrum uses a system of control codes so that the software can "tell" the hardware when a particular screen effect is required. The default values, for instance, black INK on white PAPER, are determined by the system variables but temporary effects can be produced within a PRINT or INPUT statement. Try, for example, typing:

10 PRINT " This is the colour

and then press the CAPS SHIFT and SYMBOL SHIFT keys together followed by the CYAN key — number 5 on the keyboard. Complete the PRINT statement by entering:

cyan."

The second part of the PRINT statement appears with a cyan background. Further program lines will appear in black INK on cyan PAPER.

To see how these control codes work enter the program listed in table three. Take care to press the CAPS SHIFT and SYMBOL SHIFT keys together followed by the CYAN key in between the first quotation mark and the capital A in line 10.

```
10   LET  A$  =  "(CAPS SHIFT SYMBOL SHIFT,5)ABCDEF"
20   LET  PROG  =  PEEK 23635 + 256 * PEEK 23636
100  FOR I = PROG TO PROG + 18
110  LET J = PEEK ( PROG + I )
120  IF J   15 AND J   24 THEN LET J = J + 201
130  PRINT " PROG + " ; I ; "     "; J , CHR$ J
140  NEXT I
```

Table 3. To demonstrate the PAPER control codes which look at the first nineteen bytes of the Basic area.

The program lists the contents of the first nineteen bytes of the Basic area in memory. The PROG system variable which is held at address 23635 points to the beginning of that area — normally 23755 if no microdrive hardware is attached. When the program is RUN the result is as shown in table four.

The first nineteen bytes hold the first line of the program and so the interpretation of table four is as follows. The first two bytes specify the line number — in this case, 10 — in the form:

Line number = 256*PEEK (PROG + 0) + PEEK (PROG + 1)

The next two bytes specify the line length in the form:

Line length = PEEK (PROG + 2) + 256*PEEK (PROG + 3)

The next five bytes are interpreted as:

LET A$ = "

The next two bytes — PROG + 9 and PROG + 10 — control the colour effects. Notice that the program adds 201 to the contents of PROG + 9. I have done that because otherwise an "INVALID COLOUR" error occurs. Thus the contents of PROG + 9 is really code 17 and appendix A of the Programming Manual shows that to be the PAPER control code. The next byte, PROG + 10, contains the number 5 which is the number of the CYAN key. Thus the two bytes together tell the system hardware to temporarily change the PAPER colour to CYAN.

PROG + 0	0	?
PROG + 1	10	?
PROG + 2	15	?
PROG + 3	0	?
PROG + 4	241	LET
PROG + 5	65	A
PROG + 6	36	$
PROG + 7	61	=
PROG + 8	34	"
PROG + 9	218	PAPER
PROG + 10	5	?
PROG + 11	65	A
PROG + 12	66	B
PROG + 13	67	C
PROG + 14	68	D
PROG + 15	69	E
PROG + 16	70	F
PROG + 17	34	"
PROG + 18	13	

Table 4. The display produced by the program in table 3.

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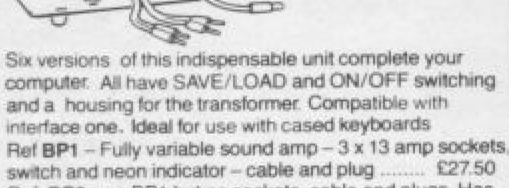
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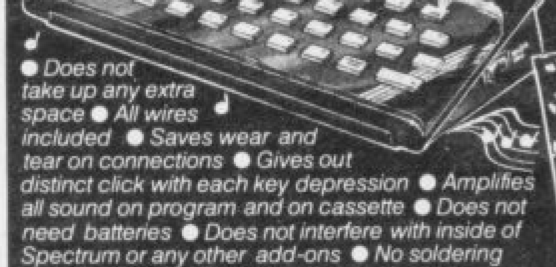
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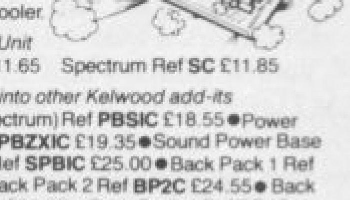
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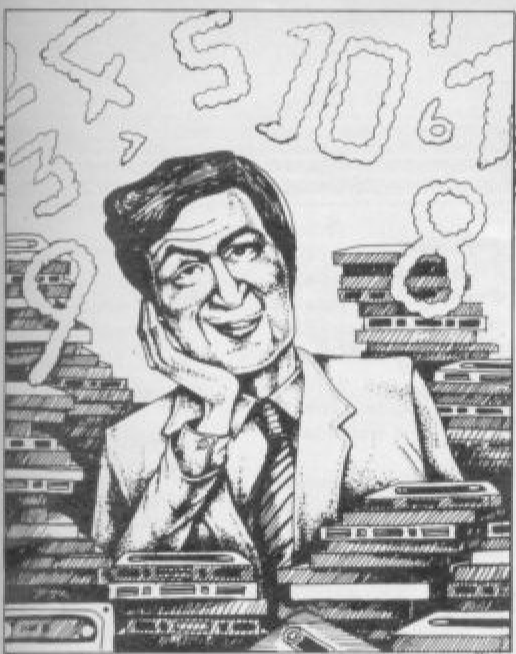
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ZX-81

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Damper	Quicksilva	7
Defenda	Quicksilva	8
Door Slammer	Cathedral	7
Forty-Niner	Software Farm	9
Froggy	DJL	7
Full-screen Breakout	New Generation	*
Galactic Trooper	Romik	6
Galaxians	Quicksilva	6
Galaxy Jailbreak	Romik	6
Games 2	JRS	*
Games Tape 1	J K Greye	*
Games Tape 1	Fawkes Computing	7
Games Tape 2	J K Greye	*
Games Tape 3	J K Greye	*
Glooper	Quicksilva	7
Gloops	Quicksilva	5
Gobbleman	Artic	*
Gobbler	Software Farm	*
Grand Prix	dK' Tronics	*
Gulp 2	Campbell	*
Hang Glider	S Electronics	6
Hickstead	CCS	5
High-resolution Invaders	Odyssey	*
Invaders	Abersoft	*
Invaders	Bug-Byte	*
Invaders	Odyssey	8
Invaders	Selec	7
Invaders	Silversoft	*
Krazy Kong	PSS	*
Maze Death Race	PSS	*
Maze Man	Abersoft	*
Mazogs	Bug-Byte	*
Namtir Raiders	Artic	8
Night Gunner	Digital Int.	5
Puckman	Hewson	*
Sabotage	Sinclair	6
Six Games	A Stubbs	5
Space Raiders	Sinclair	*
Space Trek	JRS	*
3D Monster Maze	New Generation	9
Three Games Cassette	McGraw Hill	8
Zuckman	DJL	8
ZX Invasion Force	Artic	*
ZX Panic	Selec	4
ZX-81 1K Games Pack	Crystal	9
ZX-81 Pocket Book	Phipps	*

Business

Accounts (Limited company)	Hestacrest	*
Accounts (Sole Trader)	Hestacrest	*
Business Bank Account	Transform	*
Critical Path Analysis	Hilderbay	6
Draft	Myrmidon	*
Mailing List	Hestacrest	*
Payroll	Hilderbay	*
Payroll	Soft Tech	*
Payroll	V&H Computing	*
Personal Banking System	Hilton	*
Purchase Ledger	Hestacrest	*
Sales Day Book	Transform	*
Sales Ledger	Hestacrest	*
Text	Contrast	8

Education

Calpac 1-2	Calpac	*
Four Rules of Number	Micro Master	*
Integration	University	8
Intermediate English 1-2	Rose	*
Intermediate Maths 1-2	Rose	*
Language Devel. Series	Glasson	*
Language Devel. Series	Micro Master	*
Linear Programming	University	*
Matrix Operations	University	7
O Level Chemistry	Calpac	*
O Level French Revision	Rose	*
O Level Maths Revision	Rose	*
Polynomials	University	*
Primary Arithmetic	Rose	*
Regression	University	*
Self-teach Program	Anvil	*

Language

Forth	Sinclair	7
ZX Forth	Artic	8

Practical

Ephemeris	Bridge	7
Football Pools	Hartland	*
Poolster	Naigram	3

Puzzle

Nowotnik Puzzle	Phipps	*
Word Fit	Ram Writer	6

Simulation

Fighter Pilot	Digital Int.	5
Flight Simulation	Sinclair	6
Pilot	Hewson	7
Print Shop	CCS	*

Strategy

Airline	CCS	7
Auto Chef	CCS	7
Battleships	JRS	*
Conflict	Martech	7
Cyborg Wars	Stratagem	7
Dallas	CCS	6
Farmer	CCS	*
Football Manager	Addictive Games	7
Fort Apache	Contrast	8
Galaxy Conflict	Martech	8
Great Britain Ltd	Hessel	*
Ocean Trader	Quicksilva	7
Pioneer Trail	Quicksilva	7

Traditional

Do Not Pass Go	Work Force	*
Lynchmob	Bridge	6
Original Superchess	CP Software	*
Tai	PSS	*
Tenpin	Phipps	*
ZX 1K Chess	Artic	*
ZX Compendium	Carnell	7
ZX-Chess I	Artic	*

Utility

Graphics	IPA	*
Graphics Toolkit	JRS	9
HI Resolution	CRL	6
Machine Code Test Tool	OCP	*
MCoder	PSS	8
Programme Enhancement Package	R and R	*
Renumber Delete	Work Force	*
Trace	Texgate	7
ZX Compiler	Silversoft	*
ZX Screenkit	Picturesque	*
ZX-81 Remload	Picturesque	*
ZX-Bug	Artic	*
ZX-sideprint	Microsphere	*
ZXAS	Bug-Byte	*
ZXDB	Bug-Byte	*

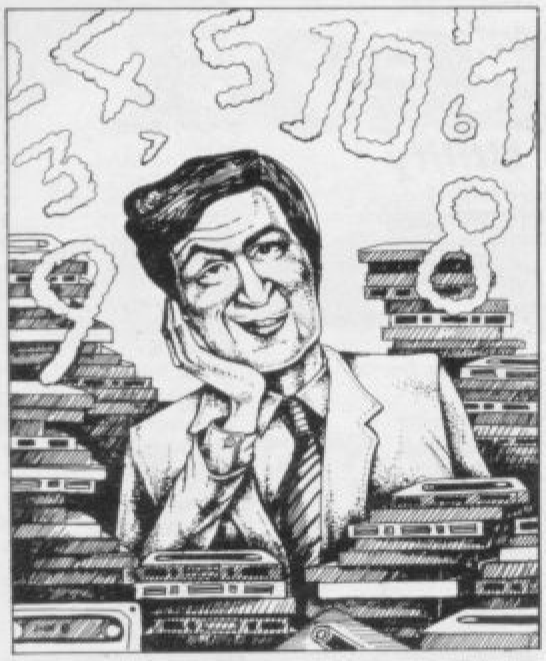
SPECTRUM 16K

Adventure

Android One	Vortex	*
Escape	New Generation	8
Mines of Saturn/Return to Earth	Mikro-Gen	*
Moria	Severn	*
Planet of Death	Artic	6
Secret Valley	Newsoft	*
The Great Western	New Soft	*
Time Bandits	New Soft	*

Arcade

Aquarius	Bug-Byte	6
Arcadia	Imagine	5
Arcadian	J K Greye	6
Assassin	Spectrasoft	*
Avenger	Abacus	5
Baron	Temptation	*
Base Invaders	Imagination	*
Black Hole	Quest	6
Blind Alley	Sunshine	7
Bug Blaster	Crystal	*
Cassette A	Orwin	*
Caterpillar	CDS	*
Cavern Fighter	Bug-Byte	4
Centi-bug	dK' Tronics	*
Children's Compendium	Dymond	*
City Defence	Mikro-Gen	*
Colour Clash	Romik	4
Cookie	Ultimate	*
Cosmic Guerilla	Crystal	8
Creepy Crawler	Mikro-Gen	*
Crevasse and Hotfoot	Microsphere	7
Cruising	Sunshine	4
Cyber Rats	Silversoft	7
Death Chase	Micromega	6
Demolition	Comp. Rentals	*
Destroyer	Winters	*
Di-lithium Lift	Hewson	3
Digger Dan	Ocean	*
Doombugs	Work Force	8
Dymonoids	Dymond	*
Earth Defence	Artic	5
Ed-On	Add-On	4
Eskimo Eddie	Ocean	*
Family Games Pack	Hornby	*
Fireflash	Abacus	5
Froggy	DJL	7
Fruit Machine	dK' Tronics	6
Galactians	dK' Tronics	*
Galactic Trooper	Romik	3
Galactic Warriors	Abacus	6
Galaxians	Artic	6
Ghost Hunt	PSS	*
Gnasher	Mastertronic	4
Gnasher	R & R	8
Gobble-a-Ghost	CDS	*
Gobbleman	Artic	*
Godzilla and Martians	Temptation	7
Ground Attack	Silversoft	6



Gulpman	Campbell	*
Haunted Hedges	Micromega	6
Hopper	PSS	6
Horace and the Spiders	Sinclair	8
Horace Goes Skiing	Sinclair	8
Hungry Horace	Sinclair	8
Invasion Force	Artic	8
It's the Wooluf	Crystal	5
Jet-Pac	Ultimate	8
Labyrinth	Axis	4
Leap Frog	CDS	*
Light Cycle	PSS	*
Luna Crabs	Micromega	7
Magic Meanies	CDS	2
Maze Chase	Hewson	8
Meteor Storm	Quicksilva	7
Meteoroids	dK' Tronics	7
Meteoroids	Softek	6
Micro Mouse	Lothlorien	6
Millypede	Add-on	7
Mined Out	Quicksilva	7
Moon Buggy	Visions	6
Mr Wong's Loopy Laundry	Artic	6
Muncher	Silversoft	6
Nanas	Mikro-Gen	*
Orbiter	Silversoft	7
Ostron	Softek	*
Pengy	Micromania	4
Pitman Seven	Visions	*
Planetoids	Sinclair	8
Proteus	Abacus	5
Rapedes	Visions	*
Repulsar	Softek	*
Rider	Virgin	6
Road Toad	DK Tronics	7
Robot Panic	Soft Mill	1
Sam Spade	Silversoft	5
Santa	Artic	*
Sentinel	Abacus	7
Shark Attack	Romik	5
Sheer Panic	Visions	7
Slippery Sid	Silversoft	8
Space Fighter	Winters	*
Space Intruders	Quicksilva	7
Space Lanes	Cathedral	*
Space Raiders	Sinclair	6
Space Zombies	Mikro-Gen	*
Spec. Frogs/ Showdown	Artic	*
Spec. Gobbleman	Artic	*
Spec. Invaders	Artic	*
Spec. Invasion Force	Artic	*
Spec. Scramble	Work Force	7
Spectipede	Mastertronic	5
Spectipede	R and R	8
Spectral Invaders	Bug-Byte	8
Spectral Panic	Hewson	5
Spectres	Bug-Byte	6
Strike Four	Spectresoft	4
Styx	Bug-Byte	7
Sub	Romik	*
Tank Battle	dK' Tronics	8
The Devil Rides In	Carnell	*
3D Monster Chase	Romik	3
Train Game	Microsphere	9
Trom	dk'Tronics	4
Vortex	JK Greye	5
Winged Warlord	CDS	6
Wizard's Warriors	Abersoft	*
Yomp	Virgin	7

Business

Finance Manager	OCP	9
Home Computer Pack	SD Micro	*
Masterfile 16	Campbell	*
Matcalc	Work Force	*
Micropen	Contrast	*
Vu-Calc	Sinclair	7
Vu-File	Sinclair	8

Education

Alphabet	Widget	*
Alphabet Games	Sinclair	*
Apostrophe	Sinclair	7
Ballooning	Heinemann	*
Calpac 1-3	Calpac	*
Car Journey	Heinemann	*
Cargo	Sinclair	*
Chess Tutor	Artic	7
Counting	Starter Soft	*
Counting	Widget	*
Education One	Lerm	*
Educational	Startersoft	*
Firework Music	Soft Cottage	8
First Numbers	Collins	*
40 Education Games	Granada	*
Four Rules of Number	Micro Master	*
French Voc Test	Tutorial	*
Hidden Letters	Poppy	*
Hot Dot Spotter	Longman	*
Integration	University	8
Intermediate English 1-2	Rose	*
Intermediate Maths 1-2	Rose	*
Know Your Tables	Collins	*
Language Devel. Series	Glasson	*
Language Devel. Series	Micro Master	*
Learn Basic	Logic 3	*
Learning Read 1	Poppy	*
Linear Programming	University	*
Marks Book	Lerm	*
Maths Invaders	Stell	*
Maths Tutor	AD Software	*
Matrix Operations	University	7
Money	Poppy	*
Night Sky	Bridge	*
O Level Maths	Homestudy	*
O Level Physics	Homestudy	*
Paddington's Shopping Mix-up	Collins	*
Pathfinder	Widget	*
Polynomials	University	8
Pre/early school cassettes	Essex	*
Primary Arithmetic	Rose	*
Punctuation Pete	Heinemann	*
Regression	University	8
Self-teach Program	Anvil	*
Shape Sorter	Widget	*
Special Agent	Heinemann	*
Spellbin	Startersoft	*
Use and Learn	Microl	8

Language

Beta Basic	Betasoft	9

Practical

Biorythms	Spectrasoft	*
Countries of the World	Hewson	8
Cycle Planner	Medidata	4
Map of the UK	Kuma	7
Shopping List	SD	*
Spectasort	Spectadraw	4

Puzzle

Flippit	Sinclair	7
Hanoi King	Contrast	7
Lojix	Virgin	3
Nowotnik Puzzle	Phipps	7
Quazar	Rose	4

Simulation

Air Traffic Controller	Hewson	6
Airliner	Protek	6
Golf	R & R	7
Golf	Virgin	7
NightFlite	Hewson	5
Print Shop	CCS	8
Pro-Golf	Hornby	7

Strategy

Auto Chef	CCS	*
Big Match Soccer	Winters	*
Dallas	CCS	6
Dictator	Bug-Byte	*
Farmer	CCS	*
Football	Winters	*
Heathrow	Hewson	8
Las Vegas	Temptation	*
Quincy	Severn	*

Traditional

Backgammon	Hewson	*
Bridge Tutor	CP	8
Bridgemaster	Bridgemaster	9
Challenge	Temptation	*
Gambling Tape	Dymond	*
Las Vegas	Temptation	5
Odds-on	RSD	*
Othello	CP Software	*
Pinball	Winters	*
Pool	Bug-Byte	7
Reversi	Sinclair	8
Roulette	Newsoft	*
Solo Whist	Video Soft.	*
Spec. Microchess	Artic	*
Super Play I	Video	*
Tennis	Winters	*

Utility

Aspect	Bug-Byte	5
Audio Sonics	Work Force	4
Auto Sonics	Buttercraft	5
Basic Utilities	Jaysoft	6
Character Generator	Spectrasoft	*
Dietron	Custom	6
Disassembler	dK' Tronics	7
Display	Work Force	*
Editor/Assembler	Picturesque	8
Extended Basic	CP	7
FP Compiler	Softek	9
Keysounder	S and G	*
Letterfont	Allanson	8
Machine Code Test Tool	OCP	7
Master Toolkit	OCP	7
MCoder	PSS	8
Micropen	Contrast	*
Print Utilities	Sinclair	7
Programmer's Dream	Work Force	8
Renumber Delete	Work Force	*
Slow Loader	ELR	9
Sound FX	dK' Tronics	6
Spec. Bug	Artic	*
Spec. Editor/ Assembler	Picturesque	8
Spec. Monitor	Picturesque	8
Spectrum Super Toolkit	Nectarine	8
Spectsound	PDQ	2
Supercode	CP	8
Taswide-64	Tasman	*
Trace	Texgate	8
TT-S	Timedata	8
ZXED	dK' Tronics	*

SPECTRUM 48K

Adventure

Abyss	CCS	6
Ace in the Hole	Add-on	*
Adventure 1	Abersoft	6
Adventure Island	Contrast	*
Alchemist	Imagine	*
Arcane Quest	Add-on	*
Atlas Assignment	Virgin	7
Black Crystal	Carnell	7
Black Dwarf's Lair	Newsoft	*
Black Planet	Phipps	7
Buffer Adventure	Buffer Micro	6
Byte	CCS	3
Castle Blackstar	SCR	7
Circus	Dig Fant	8
Classic Adventure	Melbourne Hse	*
Colditz	Phipps	8
Colossal Caves	CP	8
Cry Wolf!	Add-on	*

Crypt	Carnell	6
Demon Lord	MCE	5
Detective	Arcade	7
Devils of Deep	Shephard	*
Diamond Quest	CCS	4
Diamond Trail	Gilsoft	7
Dragonsbane	Quicksilva	6
Dungeon Master	Crystal Comp.	8
Dungeons of Doom	Temptation	3
Espionage Island	Artic	5
Everest Ascent	Shepard	6
Fantasia Diamond	Hewson	7
Golden Apple	Artic	7
Gorgon	Phipps	*
Halls of Things	Crystal Comp.	9
Here comes the sun	Alligata	7
Hobbit	Sin/Melborne Hse.	9
Hole	Add-on	*
Horror Atoll	Add-on	*
Inca Curse	Sinclair	6
Inferno	Shephard	7
Invincible Island	Shephard	8
Island	Crystal	4
Island	Virgin	7
Jericho Road	Shards	7
Jungle Adventure	CCS	4
Knight's Quest	Phipps	6
Leopard Lord	Add-on	4
Lords of Midnight	Beyond	9
Lords of Time	Level Nine	8
Lost Over Bermuda	Add-on	*
Mad Martha	Miko-Gen	7
Mad Martha II	Mikro-Gen	*
Mountains of Ket	Incentive	8
Murder at Manor	Gemtime	7
Mysterious Fairground	Buffer Micro	6
Odyssey of Hope	Martech	6
Oracle's Cave	Doric	8
Paradox	Runesoft	2
Perseus and Adromeda	Dig Fant	7
Pimania	Automata	7
Quest	Hewson	7
Quetzalcoatl	Virgin	8
Roundsby Incident	Add-on	*
Satan's Pendulum	Minatron	7
Ship of Doom	Artic	7
Solaris	Softel	*
Spoof	Runesoft	7
Superspy	Shepherd	5
Temple of Vran	Incentive	8
Terror from The Deep	Add-on	*
The Castle	Bug-Byte	*
The Orb	Comp. Rentals	*
Time Quest	Mikro-Gen	*
Titanic	R&R	5
Transylvanian Tower	Shepherd	7
Urban Upstart	Shepherd	*
Valhalla	Legend	7
Vampire Village	Terminal	4
Velnor's Lair	Quicksilva	8
Volcanic Dungeon	Carnell	6
Width of the World	Mosaic	4
Ziggarat of Dread	Add-on	*

Arcade

Ad Astra	Gargoyle Games	8
Adven. St. Bernard	Carnell	7
Android Two	Vortex	*
Ant Attack	Quicksilva	8
Antics	Bug-Byte	8
Arena 3000	Microdeal	5
Armageddon	Silversoft	3
Atic Atac	Ultimate	8
Base Invaders	Work Force	6
Bear Bovver	Artic	8
Birds and Bees	Bug-Byte	8
Blade Alley	PSS	6
Blue Thunder	R Wilcox	6
Brain Damage	Silversoft	*
Bubble Buster	Sinclair	5
Bubble Trouble	Arcade	*
Bugaboo	Quicksilva	7
Butterfly	Pulsonic	4
Caesar the Cat	Mirrorsoft	7
Carnival	Eclipse	5
Carpet Capers	Terminal	7
Cavelon	Ocean	7
Centipoid Plus 3	Orwin	5
Chequered Flag	Sinclair	8
Chuckie Egg	A & F	8
Chuckman	CCI/Add-on	8
Close-In	Pulsonic	4
Codename Mat	Micromega	9
Corridors of Genon	New Gen.	9
Cruise Attack	Mikro-Gen	*
Cyber Zone	Crystal	*
Death Chess 5000	Artic	6
Defenda	Interstella	2
Deffendar	Mikro-Gen	*
Defusion	Incentive	6
Defusion/Worms	K-Tel	3
Demon	Microcosm	*
Demon Chase	Mansfield	4
Devil Rides In	Carnell	7
Dimension Destructors	Artic	8
Dinky Digger	Postern	4
Dodge City	Phoenix	7
Dr Franky and the Monster	Virgin	6
Driller Tanks	Sinclair	3
Elektro Storm	PSS	*
Energy 30,000	Elm	3
Eric and the Floaters	Sinclair	6
Eskimo Eddie	Ocean	4
Fred	Quicksilva	6
Freez Beez	Silversoft	*
Froot Loop	NTD Software	5
Galaxy Attack	Sunshine	4
Glug Glug	CRL	6
Harry Goes Home	Pulsonic	6
Hickstead	CCS	4
High Noon	Work Force	9
House of Living Dead	Phipps	*
Hunchback	Ocean	7
Invasion Body Snatch.	Crystal	9
Jackpot	Comp. Rentals	*
Jet Set Willy	Software Projects	9
Killer Knight	Phipps	5
Knight Rider	Hewson	*
Kosmic Kanga	Micromania	5
Krakatoa	Abbex	8
Krazy Kong	PSS	*
Laserwarp	Mikro-Gen	6
Laser Zone	Quicksilva	8
Last Sunset Lattica	Arcade	*
Lazatron	Contrast	*
Les Flics	PSS	6
Loony Zoo	Phipps	6
Lunar Jetman	Ultimate	8
Manic Miner	Bug-Byte	9
Matrix	Salamander	7
Maze Death Race	PSS	*
Maziacs	dK' Tronics	8
Metagalactic Llamas	Salamander	8
Mission Impossible	Silversoft	6
Mission Omega	Pulsonic	4
Monkey Biznes	Artic	7
Moon Alert	Ocean	*
Moons of Tantalus	Cornhill	5
Mr Wimpey	Ocean	7
Mummy Mummy	Lothlorien	6
Munnery's Mergatroids	Abacus	6
1994	Visions	4
Olympimania	Automata	6
Orion	Software Projects	5
Paratroopers	Rabbit	4
Pat the Postman	Mikro-Gen	*
Pedro	Imagine	7
Penetrator	Melbourne Hse	7
Pi-Balled	Automata	7
Pi-Eyed	Automata	6
Psi-Spy	Postern	5
Pssst	Ultimate	7
Psytron	Beyond	9
Pyramid	Fantasy	8
Raider Cursed Mine	Arcade	*
Reactor	Gemini	7
Rescue	Comp. Rentals	*
Rescue	Ocean	*
Revenge of the Killer Tomatoes	Visions	6
Rider	Virgin	6
River Rescue	Creative Sparks	3
Robot Riot	Silversoft	6
Rommels Revenge	Crystal	8
Sabre Wulf	Ultimate	8
Scuba Dive	Durrell	9
Security Shelter	Add-on	*
Skull	Games Machine	5
Sorcery	Virgin	7
Space Station Zebra	Beyond	6
Spectron	Virgin	6
Splat	Incentive	8
Stop the Express	Sinclair	8
Submarine Strike	Pulsonic	6
Tank Trax	Mastertronic	3
The Guardian	PSS	6
The Snowman	Quicksilva	8
3-D Bat Attack	Cheetahsoft	6
3D Lunattack	Hewson	6
3D Seiddab Attack	Hewson	5
3D Star Wars	Add-on	1
3D Tunnel	New Generation	9
Time Gate	Quicksilva	8
Timebomb	CDS	7
Tobor	Add-on	7
Tornado Low Level	Vortex	8
Tranz Am	Ultimate	*
Trashman	New Generation	8
Traxx	Quicksilva	7
Tribble Trubble	Software Projects	8
Trom	dK'Tronics	4
Tutankhamun	Micromania	8
Two Gun Turtle	Lothlorien	7
Warlock of Firetop Mountain	Penguin	*
Wheelie	Microsphere	7
Worm Attack	Pulsonic	2
Xadom	Quicksilva	4
Zig-Zag	dK'Tronics	7
Zipper Flipper	Sinclair	4

Business

Account Management System	Fulwood	*
Accounts (Limited Company)	Hestacrest	*
Accounts (Sole Trader)	Hestacrest	*
Address File	SD Micro	*
Address Manager	OCP	7
Bank Account System	K Gouldstone	8
Bank Verifier	SD Micro	*
Business Bank Account	Transform	*
Cash Controller	Shepherd	7
Collector's Pack	Sinclair	7
Critical Path Analysis	Hilderbay	*
Database	Microl	7
DIY Book-keeping	RAMTOP	*
Heathplanner	Heath Computing	7
Investment, Insurance, Information	Inform	5
Masterfile	Campbell	8
Omnicalc	Microsphere	9
Payroll	Hilderbay	9
Payroll	Transform	*
Payroll	V&H Computing	*
Personal Banking System	Hilton	*
Personal Financ. Management Syst.	Fulwood	*
Multi-File	ISP	6
Sales Day Book	Transform	*
Small Business Accounts	Sinclair	*
Spreadsheet	Microl	7
Stock Control	Kemp	*



Software Directory

Stock Control	Hilderbay	*
Stock Control	Transform	*
Tasword	Tasman	8
Tasword II	Tasman	9
Utility File	SD Micro	*
Word Processor	Microl	*

Education

ABC Liftoff	Longman	*
Angle	Chalksoft	5
Angle Turner	Arnold Wheaton	7
Astro Maths	Scisoft	6
Castle	L'Ensouleiado	7
Castle Spellerous	Sinclair	8
Chess Tutor 1	Sinclair	7
Cortes	L'Ensouleiado	6
Countabout	Longman	*
Eiffel Tower	Chalksoft	6
Electronic Learner's Guide No. 1	ETST	6
French is Fun	CDS	5
French Mistress	Kosmos	*
French Voc Test	Tutorial	*
German is Fun	CDS	8
German Master	Kosmos	*
Guitar Tutor 1	Harlequin	*
Guitar Tutor 2	Harlequin	*
Handwriting	Chalksoft	*
Hotline	Chalksoft	5
Humpty Dumpty	Widget	8
Inkosi	Chalksoft	5
Jungle Jumble	Clever Cloggs	*
Jungle Maths	Scisoft	*
Learn to Read 1-5	Sinclair	7
Letters and Numbers	Jimjams	*
Linkword	Silversoft	6
Look Sharp	Mirrorsoft	7
Magnets	Sinclair	*
Make-a-Chip	Sinclair	*
Mansfield Park	Sussex	7
Mathskills II	Griffin	7
MDA-PCSS	MDA Assoc.	7
Model Maths	Jive	*
Mr. Men	Mirror	*
Mr. T's Measuring Games	Ebury	7
Musicmaster	Sinclair	6
Nineteenth C. England	Sussex	8
O Level Chemistry	Calpac	*
O Level Physics	Think Tank	*
Party Time	C. Tutor	*
Pathfinder	Widget	7
Pirate	Chalksoft	7
Quick Thinking	Mirrorsoft	*
Sequences	Chalksoft	5
Spanish Gold	Chalksoft	*
Speak and Spell	S and G	*
Speech Marks	Sinclair	7
Spelling Bee	Image Systems	5
Star Reader	Scisoft	*
Startrucker	Widget	7
Teacher Data	B Farris	8
Tense French	Sulis	7
Time Traveller	Willey	*
Tuner	Soft Cottage	*
Whizz Kid	Comp. Tutor	*
Wizard Box	Scisoft	*
Zoo	L'Ensouleiado	6

Language

Forth	Melbourne Hse.	9
Forth	Sinclair	7
Micro Prolog	Sinclair	8
Pascal Compiler	Hi-Soft	*
Snail Logo	CP	8
Spec. Forth	Abersoft	9
Spec. Forth	CP	8
ZX Forth	Artic	8

Practical

Beamscan	Beamscan	9
Computer Cookbook	Bug Byte	5
Cricket Averages	Spartan CC	7
Diet	dK' Tronics	*
Diet Master	Diet Master	6
Dietician	Keysoft	4
Engine Diagnostic	Spectrasoft	*
First Aid	Eastmead	4
Football Pools	Hartland	*
How Long have you got?	Eastmead	6
I Ching	Salamander	7
I Ching	Sirius	*
Personal Reminder	SD Micro	*
Star Gazer	CRL	8
The Complete Guide to Medicine	Eastmead	4
Vega-Table	Vega	7
World Info	Wimsoft	*

Puzzle

Arcturus	Visions	7
Computaword	Work Force	2
Flix	Softricks	7
Hanoi King	Contrast	*
Jumbly	dK' Tronics	*
Mazecube	PAL	6
3D Strategy	Quicksilva	8
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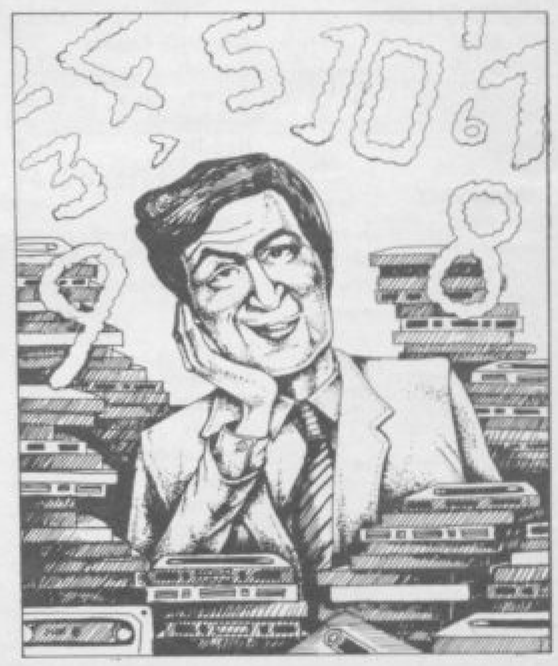
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